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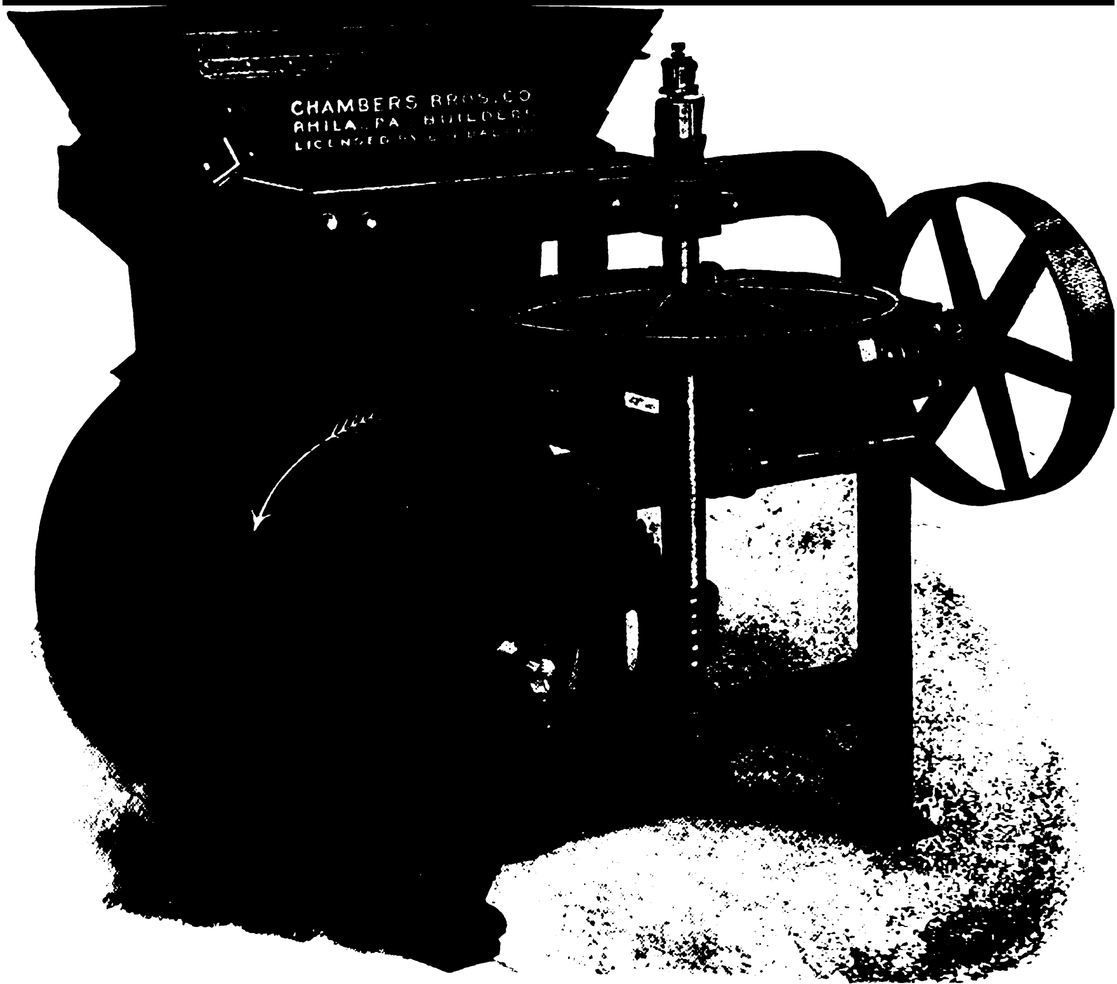

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American Society of Mechanical Engineers

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CONDENSED CATALOGUES
OF
MECHANICAL EQUIPMENT

A COLLECTION OF CATALOGUE DATA CONCERNING
THE PRODUCTS OF MANUFACTURERS
OF MECHANICAL EQUIPMENT

THIRD ANNUAL VOLUME
DECEMBER 1913

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PUBLIC
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THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS
29 West 39th Street
NEW YORK

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Aluminum Co. of America

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Monarch Boiler Arch Co.

Arches, Ignition (Flat Suspended)
Illinois Stoker Co.
Green Engineering Co.
Laclede-Christy Clay Products Co.

Arches, Rear Combustion Chamber
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Keasbey Co., Robert A.

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Green Engineering Co.

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Ajax Metal Co.
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Ball Gages
Atlas Ball Co.

Balls, Brass and Bronze
Auburn Ball Bearing Co.
Lunkenheimer Co.

Balls, Steel
Atlas Ball Co.
Auburn Ball Bearing Co.
New Departure Manufacturing Co.

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Tagliabue Manufacturing Co., C. J.

Barometric Condensers
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Mohr & Sons, John
Royersford Foundry & Machine Co.

Bars, Grate
(See Grates and Grate Bars)

Bearing Metals
(See Metals, Bearing)

Bearing Testing Machines
Olsen Testing Machine Co., Tinius
Riehlé Bros. Testing Machine Co.

Bearings, Ball
Auburn Ball Bearing Co.
Hess-Bright Manufacturing Co.
New Departure Manufacturing Co.
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Bearings, Bronze
Ajax Metal Co.
Allan & Son, A.
American Brass Co.
Lumen Bearing Co.
Metaline Co.

Bearings, Die-Cast
Ajax Metal Co.

Bearings, Oilless
Metaline Co.

Bearings, Roller
Hyatt Roller Bearing Co.
Royersford Foundry & Machine Co.

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American Tool & Machine Co.
Brown Co., A. & F.

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Cincinnati Planer Co.
Detrick & Harvey Machine Co.

Boring Machines, Horizontal and Vertical
Detrick & Harvey Machine Co.
Mitts & Merrill

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American Vulcanized Fibre Co.

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Duff Manufacturing Co.

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McCrosky Reamer Co.

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Brakes, Air
National Brake & Electric Co.

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Bridgeport Brass Co.
Lumen Bearing Co.

Brass Specialties
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Hill Pump Valve Co.
Lunkenheimer Co.

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Laclede-Christy Clay Products Co.

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Chambers Brothers Co.

Bridges
Riter-Conley Manufacturing Co.

Bridges, Stocking and Reclaiming
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Bridge Machinery
Currier & Sons, Cyrus

Bridge Tramways
(See Tramways, Bridge)

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Chambers Brothers Co.

Buckets, Elevator
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Illinois Malleable Iron Co.
Link-Belt Co.
Robins Conveying Belt Co.
Stephens-Adamson Mfg. Co.
Weller Manufacturing Co.

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Brown Hoisting Machinery Co.
Clyde Iron Works
Hunt Co., Inc., C. W.
Link-Belt Co.
Robins Conveying Belt Co.

Buckets, Self-Dumping
Brown Hoisting Machinery Co.
Clyde Iron Works
Hunt Co., Inc., C. W.

Bull Ring Metal
Ajax Metal Co.
Allan & Son, A.

Bulldozers
Ajax Manufacturing Co.
Vulcan Engineering Sales Co.
Williams, White & Co.
Wood & Co., R. D.

Burners, Gas
Chicago Flexible Shaft Co.

Burners, Oil
Chicago Flexible Shaft Co.
Lunkenheimer Co.
Petroleum Iron Works Co.
Spray Engineering Co.
Weller Manufacturing Co.

Burring Machines
Ajax Manufacturing Co.

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(See Wire and Cables, Electrical)

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Cabling Machines
New England Butt Co.

Calendering and Embossing Machines
Currier & Sons, Cyrus

Calorimeters
American Steam Gauge & Valve Mfg. Co.

Carbonizing
Williams & Co., J. H.

Carriers, Cash and Package
Lamson Co.

Carriers, Pick-Up and Delivery
Lamson Co.

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Carriers and Elevators, Freight, Continuous
Gifford-Wood Co.
Link-Belt Co.
Otis Elevator Co.
Robins Conveying Belt Co.
Stephens-Adamson Mfg. Co.
Weller Manufacturing Co.

Cars, Dump
Hunt Co., Inc., C. W.
Weller Manufacturing Co.

Cars, Industrial Railway
Badger & Sons Co., E. B.
Hunt Co., Inc., C. W.
Link-Belt Co.
Stephens-Adamson Mfg. Co.

Cars, Motor
Hunt Co., Inc., C. W.

Carton Sealing Machines
(See Sealing Machines, Carton)

Case Hardening
Chicago Flexible Shaft Co.
Williams & Co., J. H.

Cash and Package Carriers
(See Carriers, Cash and Package)

Casing, Steam Pipe
(See Covering, Steam Pipe)

Castings, Aluminum
Aluminum Co. of America
D'Este Co., Julian
Lunkenheimer Co.

Castings, Brass and Bronze
Ajax Metal Co.
Allan & Son, A.
American Tool & Machine Co.
Badger & Sons Co., E. B.
Bayonne Casting Co.
Burhorn Co., Edwin
Darling Pump & Mfg. Co., Ltd.
D'Este Co., Julian
Illinois Malleable Iron Co.
Kelly & Jones Co.
Lumen Bearing Co.
Lunkenheimer Co.
McCord Manufacturing Co.
Marshall Foundry Co.
Pittsburgh Valve, Foundry & Construction Co.

Castings, Die-Molded
Ajax Metal Co.
American Brass Co.
Veeder Manufacturing Co.

Castings, Iron
American Tool & Machine Co.

Cement [illegible]

[illegible]

Cement [illegible]

[illegible]

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Rie[illegible]

Centers, Planer
[illegible]

Centrifugals, for [illegible] etc.
American [illegible]
D'Olie[illegible] chine Co.

Centrifugals, Clarifying and [illegible]ing
D'Olier Centrifugal [illegible] & Machine Co

Centrifugals, Oil and Waste
American Tool & Ma[illegible]

[illegible] Works Co., John
[illegible] Iron Works Co.
[illegible] Manufacturing Co.
[illegible] Co.
[illegible] Co., Henry

[illegible] Drill
[illegible] Co
[illegible] Co

[illegible]
[illegible] Co

[illegible] Planer
[illegible] Planer Co.

[illegible]
[illegible] W.
[illegible] Co
[illegible] Mfg. Co.
[illegible] Engineering Co., Inc.

Circulators, Steam Heating
Bloomsburg & Co. H

Circulators, Feed Water
Bloomsburg & Co. H

Clamps, Pipe Joint
[illegible] Co.

Clamps, Steel
Williams & Co. J. H.

Clamps, Wire Rope
(See Wire Rope Fastenings)

Clay Products and Refractories
[illegible] Clay Products Co.

Clay Working Machinery
[illegible] Brothers Co.
W[illegible] Crusher & Pulverizer Co.

- **Clevis, Nuts**
  - (See Nuts, Clevis)
- **Clipping Machines**
  - Chicago Flexible Shaft Co.
- **Clutches, Friction**
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  - Brown Co., A. & F.
  - Caldwell & Son Co., H. W.
  - Chambers Brothers Co.
  - Falls Clutch & Machinery Co.
  - Gifford-Wood Co.
  - Hill Clutch Co.
  - Link-Belt Co.
  - Reeves Pulley Co.
  - Stephens-Adamson Mfg. Co.
  - Weller Manufacturing Co.
  - Wood's Sons Co., T. B.
- **Clutch Leathers**
  - (See Leathers, Automobile)
- **Coal and Ash Handling Machinery**
  - Brown Hoisting Machinery Co.
  - Caldwell & Son Co., H. W.
  - Gifford-Wood Co.
  - Green Engineering Co.
  - Hunt Co., Inc., C. W.
  - Illinois Stoker Co.
  - Link-Belt Co.
  - Robins Conveying Belt Co.
  - Stephens-Adamson Mfg. Co.
  - Weller Manufacturing Co.
- **Coal Cleaners**
  - Pennsylvania Crusher Co.
- **Coal Crushers**
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  - Link-Belt Co.
  - Pennsylvania Crusher Co.
  - Robins Conveying Belt Co.
  - Stephens-Adamson Mfg. Co.
  - Vulcan Iron Works
  - Williams Patent Crusher & Pulverizer Co.
- **Coal Mining Machinery**
  - Ingersoll-Rand Co.
- **Coaling Stations, Locomotive**
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  - Hunt Co., Inc., C. W.
  - Link-Belt Co.
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- **Coils, Pipe**
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  - Vogt Machine Co., Henry
- **Coffee Mill Machinery**
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  - American Steam Gauge & Valve Mfg. Co.
  - Crane Co.
  - Detroit Lubricator Co.
  - Hills-McCanna Co.
  - Jenkins Bros.
  - Kelly & Jones Co.
  - Lunkenheimer Co.
  - McNab & Harlin Manufacturing Co.
  - Nason Manufacturing Co.
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- **Cocks, Blowoff**
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  - Marshall Foundry Co.
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  - (See Arches, Combustion Chamber)
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  - Blake & Knowles Steam Pump Works
  - Devine Co., J. P.
  - Goulds Manufacturing Co.
  - Hardie-Tynes Manufacturing Co.
  - Hooven, Owens, Rentschler Co.
  - Ingersoll-Rand Co.
  - Nash Engineering Co.
  - National Brake & Electric Co.
  - Nordberg Manufacturing Co.
  - Otto Gas Engine Works
  - Roots Co., P. H. & F. M.
  - Worthington, Henry R.
- **Compressors, Compound Air**
  - Ingersoll-Rand Co.
  - National Brake & Electric Co.
  - Nordberg Manufacturing Co.
- **Compressors, Gas**
  - Blake & Knowles Steam Pump Works
  - Hardie-Tynes Manufacturing Co.
  - Hoovens, Owens, Rentschler Co.
  - Ingersoll-Rand Co.
  - National Brake & Electric Co.
  - Nordberg Manufacturing Co.
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  - (See Mixers, Concrete)
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- **Condensation Pumps with Automatic Receivers**
  - (See Pumps, Condensation, with Automatic Receivers)
- **Condensation Receiver and Pump Governor**
  - Boylston Steam Specialty Co.
  - Davis Regulator Co., G. M.
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- **Condenser Tubes**
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Conveying Systems

[illegible] Pulverizer Co.

Conveying Weighers

(See Weighers, Conveyor)

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[illegible] Gauge & Valve

[illegible] Manufacturing Co.

[illegible] and Belt Shifters

[illegible] Foundry

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[illegible] Manufacturing Co.

[illegible] Co., Inc.

[illegible] Clutch & Machinery Co.

[illegible] Owen, Rentschler Co.

[illegible] F. H. & F. M.

[illegible] Patent Crusher & Pulverizer Co.

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[illegible] Manufacturing Co.

[illegible] Co.

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McNab & Harlin Manufacting Co.
Mark Manufacturing Co.
National Tube Co.
Pittsburgh Valve, Foundry & Construction Co.
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Hill Clutch Co.
Nordyke & Marmon Co.
Royersford Foundry & Machine Co.
Weller Manufacturing Co.
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Keasbey Co., Robert A.

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Bigelow Co.
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Knowlton, M. D.

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(See Regulators, Damper)

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Power Specialty Co.

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Braeburn Steel Co.
Colonial Steel Co.

Die Making
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Die Sinkers
Bliss Co., E. W.

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Jones & Lamson Machine Co.
Modern Tool Co.

Dies, Sheet Metal Working
Bliss Co., E. W.
Mossberg Co., Frank

Dies, Stamping
Bliss Co., E. W.
Mossberg Co., Frank

Digesters
American Process Co.
Bigelow Co.

Digestors, Pulp
Hooven, Owens, Rentschler Co.
Petroleum Iron Works Co.

Discs, Rubber
(See Gaskets)

[illegible] Contractors

[illegible] Works

[illegible] & [illegible]

[illegible] Co.

[illegible] Hentschler Co.

[illegible] turing Co.

[illegible] Co.

[illegible] turing Co.

[illegible] hler Co.

[illegible] Co.

[illegible] Works

Reeves Pulley Co.
Sturtevant Co., B. F.

Engines, Gridiron Valve
McIntosh & Seymour Co.

Engines, High Speed
American Blower Co.
American Engine & Electric Co.
Ball Engine Co.
Buckeye Engine Co.
Fitchburg Steam Engine Co.
McIntosh & Seymour Co.
Nordberg Manufacturing Co.
Skinner Engine Co.
Sturtevant Co., B. F.
Troy Engine & Machine Co.

Engines, Hoisting
Brown Hoisting Machinery Co.
Clyde Iron Works
Hardie-Tynes Manufacturing Co.
Hunt Co., Inc., C. W.
Morris Machine Works
Nordberg Manufacturing Co.
Otto Gas Engine Works
Vulcan Iron Works

Engines, Oil
Busch-Sulzer Bros.-Diesel Engine Co.
De La Vergne Machine Co.
Falk Co.
Lyons Atlas Co.
Otto Gas Engine Works

Engines, Poppett Valve, for Superheated Steam
Nordberg Manufacturing Co.

Engines, Pumping
Hooven, Owens, Rentschler Co.
Morris Machine Works
Nordberg Manufacturing Co.
Otto Gas Engine Works
Wetherill & Co., Inc., Robt.
Wood & Co., R. D.
Worthington, Henry R.

Engines, Steam
American Blower Co.
American Engine & Electric Co.
Ball Engine Co.
Buckeye Engine Co.
Clyde Iron Works
Detroit Stoker Co.
Fitchburg Steam Engine Co.
Green Fuel Economizer Co.
Hardie-Tynes Manufacturing Co.
Hooven, Owens, Rentschler Co.
McIntosh & Seymour Co.
Morris Machine Works
Nordberg Manufacturing Co.
Providence Engineering Works
Skinner Engine Co.
Sturtevant Co., B. F.
Troy Engine & Machine Co.
Wetherill & Co., Inc., Robt.
Wheeler Condenser & Engineering Co.

Engines, Uniflow
Nordberg Manufacturing Co.

Escalators
Otis Elevator Co.

Evaporators
Marshall Foundry Co.

Excavating Machinery
Clyde Iron Works
Marion Steam Shovel Co.

Exhaust Fans
(See Fans, Exhaust)

Exhaust Heads
Best Manufacturing Co.
Boylston Steam Specialty Co.
Crane Co.
Pittsburgh Valve, Foundry & Construction Co.
Sturtevant Co., B. F.
Willcox Engineering Co., Inc.

Exhaust Outlets
Marshall Foundry Co.

Exhausters, Gas
American Blower Co.
Green Fuel Economizer Co.
Roots Co., P. H. & F. M.
Sturtevant Co., B. F.
Wilbraham-Green Blower Co.

Expanding Mandrels
(See Mandrels, Expanding)

Expansion Joints
(See Joints, Expansion)

Extracting Apparatus
Devine Co., J. P.

Extractors, Grease
(See Separators, Oil)

Extractors, Tar
Smith Gas Power Co.

Extruded Metals
(See Metals, Extruded)

Facings, Foundry
United State Graphite Co.

Fans, Automobile
McCord Manufacturing Co.

Fans, Electric
American Blower Co.
Green Fuel Economizer Co.
Robbins & Meyers Co.
Sturtevant Co., B. F.

Fans, Exhaust and Ventilating
American Blower Co.
Green Fuel Economizer Co.
Robbins & Meyers Co.
Sturtevant Co., B. F.
Vulcan Iron Works

Feed Water Circulators, Heaters, Regulators, etc.
(See Circulators, Heaters, Regulators, etc., Feed Water)

Feed Water Heaters and Purifiers
(See Heaters and Purifiers, Feed Water)

Ferrules
Bridgeport Brass Co.
American Vulcanized Fibre Co.

Fibre, Vulcanized
American Vulcanized Fibre Co.

Fibre Shipping Case Machinery
Knowlton Co., M. D.

Filters, Oil
Bowser & Co., Inc., S. F.
Koven & Brother, L. O.
Richardson-Phenix Co.

Filters, Water
Fetta Water Softener Co.
Kennicott Co.
Koven & Brother, L. O.
Loomis-Manning Filter Distributing Co.

Finishing Machinery, Cloth
Currier & Sons, Cyrus

Fire Hydrants
(See Hydrants, Fire)

Fire Tube Boilers
(See Boilers, Tubular)

Fittings, Aluminum
Aluminum Co. of America

Fittings, Ammonia
Crane Co.
De La Vergne Machine Co.
Kelly & Jones Co.
Lunkenheimer Co.
Nason Manufacturing Co.
Vogt Machine Co., Henry

Furnaces, Electric
Ajax Metal Co.

Furnaces, Gas
Chicago Flexible Shaft Co.
Hawley Down Draft Furnace Co.
Koven & Brother, L. O.

Furnaces, Melting
Chicago Flexible Shaft Co.
Hawley Down Draft Furnace Co.
Koven & Brother, L. O.

Furnaces, Oil
Chicago Flexible Shaft Co.
Hawley Down Draft Furnace Co.
Ingersoll-Rand Co.

Furnaces, Smokeless
Detroit Stoker Co.
Green Engineering Co.
Hawley Down Draft Furnace Co.
Illinois Stoker Co.
Laclede-Christy Clay Product Co.
Model Stoker Co.
Murphy Iron Works
O'Brien Boiler Works Co., John

Gage Boards
American Steam Gauge & Valve Mfg. Co.

Gage Testers
American Steam Gauge & Valve Mfg. Co.

Gages, Ammonia
American Steam Gauge & Valve Mfg. Co.
Nason Manufacturing Co.
Pratt & Cady Co.

Gages, Differential Pressure
American Steam Gauge & Valve Mfg. Co.

Gages, Draft
American Steam Gauge & Valve Mfg. Co.
Tagliabue Manufacturing Co., C. J.

Gages, Hydraulic
American Steam Gauge & Valve Mfg. Co.
Lunkenheimer Co.

Gages, Pressure
American Steam Gauge & Valve Mfg. Co.
Goulds Manufacturing Co.
Lunkenheimer Co.

Gages, Rate of Flow
Builders Iron Foundry
Simplex Valve & Meter Co.

Gages, Recording
American Steam Gauge & Valve Mfg. Co.
Builders Iron Foundry
Lunkenheimer Co.
Simplex Valve & Meter Co.
Willcox Engineering Co., Inc.

Gages, Surface, Depth, Dial, etc.
Atlas Ball Co.

Gages, Vacuum
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Lunkenheimer Co.
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American Steam Gauge & Valve Mfg. Co.
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Detroit Lubricator Co.
Jenkins Bros.
Kelly & Jones Co.
Lunkenheimer Co.
McNab & Harlin Manufacturing Co.
Penberthy Injector Co.
Pratt & Cady Co.

Gages, Water Level
American Steam Gauge & Valve Mfg. Co.
Simplex Valve & Meter Co.

Galvanizing
Illinois Malleable Iron Co.
Koven & Brother, L. O.

Gas Burners, Compressors, Engines, Exhausters, etc.
(See Burners, Compressors, Engines, Exhausters, etc., Gas)

Gas Cleaning Plants
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Wood & Co., R. D.

Gas Line Materials
Pittsburgh Valve, Foundry & Construction Co.

Gas Plant Machinery
Riter-Conley Manufacturing Co.
Wood & Co., R. D.

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Jenkins Bros.
McCord Manufacturing Co.
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Restein Co., Inc., Clement

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Chapman Valve Manufacturing Co.
Ludlow Valve Manufacturing Co.
Pittsburgh Valve, Foundry & Construction Co.
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Hill Clutch Co.
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Weller Manufacturing Co.

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Grinding Machines, Cylin
Landis Tool Co.
Modern Tool Co.

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Landis Tool Co.
Modern Tool Co.

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Blake & Knowles Steam Pump Works
National Pipe Bending Co.
Wickes Boiler Co.

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Link-Belt Co.
Northern Engineering Works
Otis Elevator Co.
Vulcan Iron Works

Hoists, Gas and Gasoline
Otto Gas Engine Works

Hoists, Hand (Chain and Rope)
Brown Hoisting Machinery Co.
Clyde Iron Works
Gifford-Wood Co.
Hunt Co., Inc., C. W.
Link-Belt Co.

Hoists, Pneumatic
Gifford-Wood Co.
Ingersoll-Rand Co.
Northern Engineering Works
Vulcan Engineering Sales Co.

Hoists, Skip
Hunt Co., Inc., C. W.
Otis Elevator Co.
Robins Conveying Belt Co.

Holders, Gas
Koven & Brother, L. O.
Riter-Conley Manufacturing Co.
Wood & Co., R. D.

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Norton Co.

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American Metal Hose Co.
Boston Belting Co.
Goodrich Co., B. F.
Ingersoll-Rand Co.
National Brake & Electric Co.

Hose, Flexible Metal
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Hose, Linen
Boston Belting Co.
Goodrich Co., B. F.
Rossendale-Reddaway Belting & Hose Co.

Hose, Metal
American Brass Co.
American Metal Hose Co.

Hose, Oil
American Metal Hose Co.
Boston Belting Co.
Goodrich Co., B. F.
Restein Co., Inc., Clement

Hose, Rubber
Boston Belting Co.
Goodrich Co., B. F.
Restein Co., Inc., Clement

Hose, Steam
American Metal Hose Co.
Boston Belting Co.
Goodrich Co., B. F.
Ingersoll-Rand Co.
Restein Co., Inc., Clement

Hose, Suction
American Metal Hose Co.
Boston Belting Co.
Goodrich Co., B. F.

Hose Attachments (Couplings, Bands, Holders, Clamps, etc.)
Goodrich Co., B. F.
Ingersoll-Rand Co.
McNab & Harlin Manufacturing Co.
National Brake & Electric Co.

Hydrants, Fire
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Darling Pump & Mfg. Co., Ltd.
Ludlow Valve Manufacturing Co.
Pratt & Cady Co.
Wood & Co., R. D.

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Hygrometers
Tagliabue Manufacturing Co., C. J.

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Vogt Machine Co., Henry

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Gifford-Wood Co.

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Jacks, Hydraulic

[illegible]

Jacks, Geared

[illegible]

Jacks, Lifting

[illegible]

Jacks, Screw

[illegible]
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Jacks, Traversing

Duff Manufacturing Co.
Joyce-Cridland Co.

Jets, Steam

(See Blowers, Steam Jet)

Joints, Expansion

American District Steam Co.
Badger & Sons Co., E. B.
Best Manufacturing Co.
Crane Co.
[illegible] & Jones Co.
Lunkenheimer Co.
McNab & Harlin Manufacturing Co.
National Tube Co.
Pittsburgh Valve, Foundry & Construction Co.
Power Specialty Co.
[illegible] Condenser & Engineering Co.
[illegible] Manufacturing Co., C. H.

Joints, Flanged Pipe

Best Manufacturing Co.
Crane Co.
Pittsburgh Valve, Foundry & Construction Co.

Joints, Flexible

Best Manufacturing Co.

Joints, Ball

[illegible] Co.
[illegible] Co.

Joints, Swing and Swivel

Best Manufacturing Co.
Crane Co.
Lunkenheimer Co.
McNab & Harlin Manufacturing Co.

Jolt Ramming Machines

(See Rammers, Foundry)

Kettles

[illegible] & Brother [illegible]
Milwaukee Boiler Co.
Struthers-Wells Co.

Key Seaters

Mitts & Merrill

Keyway Cutters

Mitts & Merrill

Keys, Machine

Williams & Co., J. H.

Kilns, Dry (Brick, Lumber, Sand, etc.)

American Blower Co.
Sturtevant Co., B. F.

Kilns, Cement

[illegible] Iron Works

Knives, Machine

American Tool & Machine Co.
Knowlton Co., M. D.
Mitts & Merrill

Ladles

Marshall Foundry Co.
[illegible] & Sons, John
Northern Engineering Works
Petroleum Iron Works Co.
[illegible] Manufacturing Co.

Lamps, Incandescent and Arc

General Electric Co.

Lamp Brackets

(See Brackets, Lamp)

Land-Clearing Machinery

Clyde Iron Works

Lath Mill Machinery

Mitts & Merrill

Lathe Attachments

Acme Machine Tool Co.
American Tool & Machine Co.
Fitchburg Machine Works

Lathe Dogs

Williams & Co., J. H.

Lathe Tools

(See Tools, Lathe)

Lathes, Automatic

Jones & Lamson Machine Co.

Lathes, Brass
Acme Machine Tool Co.
American Tool & Machine Co.
Warner & Swasey Co.

Lathes, Chucking
Jones & Lamson Machine Co.

Lathes, Shaft Turning
Fitchburg Machine Works

Lathes, Turret
Acme Machine Tool Co.
American Tool & Machine Co.
Jones & Lamson Machine Co.
Warner & Swasey Co.
Windsor Machine Co.

Leather Belting, Packing, etc.
(See Belting, Packing, etc., Leather)

Leathers, Automobile
Graton & Knight Mfg. Co.
Jewell Belting Co.

Leathers, Pump
Graton & Knight Mfg. Co.

Lightning-Arresters
General Electric Co.

Linings, Hollow Stack
Laclede-Christy Clay Products Co.

Locomobiles
Buckeye Engine Co.

Locomotives, Compressed Air
Ingersoll-Rand Co.
Vulcan Iron Works

Locomotives, Electric
Brown Hoisting Machinery Co.
Hunt Co., Inc., C. W.
Robins Conveying Belt Co.

Locomotives, Gasoline
Vulcan Iron Works

Locomotives, Steam
Vulcan Iron Works

Logging Machinery
Clyde Iron Works
Marion Steam Shovel Co.

Lubricants
Albany Lubricating Co.
Texas Oil Co.
United States Graphite Co.

Lubricants, Roller and Ball Bearing
Royersford Foundry & Machine Co.

Lubricators
Albany Lubricating Co.
Crane Co.
Lunkenheimer Co.

Lubricators, Force-Feed, Sight-Feed
Detroit Lubricating Co.
Greene, Tweed & Co.
Hills-McCanna Co.
Lunkenheimer Co.
McCord Manufacturing Co.
Madison-Kipp Lubricator Co.
Pickering Governor Co.
Richardson-Phenix Co.

Lubricators, Hydrostatic, Sight-Feed
Detroit Lubricator Co.
Lunkenheimer Co.
Penberthy Injector Co.

Machine Handles
(See Handles, Machine)

Machinery
is classified under the headings descriptive of character thereof

Machinists and Engineers
American Tool & Machine Co.
Bilgram Machine Works
Brown Co., A. & F.
Builders Iron Foundry
Caldwell & Son Co., H. W.
Currier & Sons, Cyrus
D'Olier Centrifugal Pump & Machine Co.
Gifford-Wood Co.
Hill Clutch Co.
Nordyke & Marmon Co.
Pittsburgh Valve, Foundry & Construction Co.
Weller Manufacturing Co.
Wood & Co., R. D.

Machinists' Small Tools
Atlas Ball Co.
Williams Co., J. H.

Mandrels, Expanding
McCrosky Reamer Co.

Measures, Registering
(See Meters)

Measuring and Feeding Machines
Chambers Brothers Co.

Measuring and Mixing Machines
Conveying Weigher Co.

Mechanical Draft Apparatus
American Blower Co.
Green Fuel Economizer Co.
Sturtevant Co., B. F.

Mechanical Stokers
(See Stokers)

Metal Bearings, Hose, Packing, etc.
(See Bearings, Hose, Packing, etc., Metal)

Metaline
Metaline Co.

Metal Work, Plate
Bigelow Co.
Burhorn Co., Edwin
Heine Safety Boiler Co.
Keeler Co.
Kennicott Co.
Koven & Brother, L. O.
Milwaukee Boiler Co.
Mohr & Sons, John
O'Brien Boiler Works Co., John
Petroleum Iron Works Co.
Riter-Conley Manufacturing Co.
Struthers-Wells Co.
Wetherill & Co., Inc., Robt.
Willcox Engineering Co., Inc.
Wood & Co., R. D.

Metal Work, Sheet
Badger & Sons Co., E. B.
Bridgeport Brass Co.
Mossberg Co., Frank
Weller Manufacturing Co.
Willcox Engineering Co., Inc.

Metal Work, Stamped
Bridgeport Brass Co.
Mossberg Co., Frank
Root Co., C. J.
Willcox Engineering Co., Inc.

Metals, Anti-Friction
Ajax Metal Co.
Allan & Son, A.
Lumen Bearing Co.
Metaline Co.

Metals, Bearing
Ajax Metal Co.
Allan & Son, A.
American Brass Co.
Lumen Bearing Co.
Metaline Co.

Metals, Extruded
Aluminum Co. of America
American Brass Co.

Metals, Gear
Ajax Metal Co.
Lumen Bearing Co.

Metals, White
Ajax Metal Co.
American Brass Co.

Meters, Air, Steam and Gas
American District Steam Co.
Builders Iron Foundry
General Electric Co.

Meters, Electric
General Electric Co.

Meters, Oil
Bowser & Co., Inc., S. F.
Worthington, Henry R.

Meters, Pitot Tube
Simplex Valve & Meter Co.

Meters, V-Notch Recording
Yarnall-Waring Co.

Meters, Venturi
Builders Iron Foundry
National Meter Co.
Simplex Valve & Meter Co.

Meters, Water
Builders Iron Foundry
National Meter Co.
Simplex Valve & Meter Co.
Wilcox Engineering Co., Inc.
Worthington, Henry R.
Yarnall-Waring Co.

Milling Machines, Plain
American Tool & Machine Co.
Mitts & Merrill
Warner & Swasey Co.

Milling Tools, Adjustable
Geometric Tool Co.
Modern Tool Co.

Mixing Machines, Sand
Vulcan Engineering [illegible]

Mixers, Clay, Fertilizer, Chips, etc.
Williams [illegible] Co.

Mixers, Concrete
Conveying [illegible]
Knickerbocker [illegible]

Molds, Ingot
[illegible]
Marshall [illegible]

Molding Machines
Vulcan [illegible]

Monel Metal
[illegible]
[illegible]

Motors, [illegible]
Ingersoll-Rand Co.

Motors, [illegible]
[illegible]

[illegible]

Nuts, Clevis
Cleveland City Forge & Iro

Odometers
Veeder Manufacturing Co.

Oil and Grease Cups
Albany Lubricating Co.
Crane Co.
Detroit Lubricator Co.
Lunkenheimer Co.
Penberthy Injector Co.

Oil Burners, Engines, Filters, Pumps, etc.
(See Burners, Engines, Filters, Pumps, etc., Oil)

Oil Refineries
Petroleum Iron Works Co.

Oil Separating Machines, Centrifugal
American Tool & Machine
D'Olier Centrifugal Pump & Machine Co.

Oil Storage Systems
Bowser & Co., Inc., S. F.

Oil Tanks
Bowser & Co., Inc., S. F.
Lunkenheimer Co.
Richardson-Phenix Co.

Oil Testing Instruments
Tagliabue Manufacturing Co., C. J.

Oil Testing Machines
Olsen Testing Machine Co., Tinius
Riehlé Bros. Testing Machine Co.

Oiling Devices
Bowser & Co., Inc., S. F.
Lunkenheimer Co.
Richardson-Phenix Co.

Oiling Systems
Bowser & Co., Inc., S. F.
Lunkenheimer Co.
Richardson-Phenix Co.

Oils
Albany Lubricating Co.
Texas Co.

Openers, Sash and Window
Drouvé Co., G.

Openers, Skylight Window
Drouvé Co., G.

Ore Handling Machinery
Brown Hoisting Machinery Co.
Hunt Co., Inc., C. W.
Link-Belt Co.
Robins Conveying Belt Co.

Oscillators, Electric Riddle
Vulcan Engineering Sales Co.

Ovens
Koven & Brother, L. O.
Chicago Flexible Shaft Co.

Oxy-Acetylene Welding
(See Welding, Oxy-Acetylene)

Packing, Asbestos
Goetze Gasket & Packing Co.
Greene, Tweed & Co.
Keasbey Co., Robert A.
Restein Co., Inc., Clement.

Packing, Hydraulic
Boston Belting Co.
Goetze Gasket & Packing Co.
Goodrich Co., B. F.
Graton & Knight Mfg. Co.
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Keasbey Co., Robert A.
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Power Specialty Co.
Restein Co., Inc., Clement

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Goodrich Co., B. F.
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Keasbey Co., Robert A.
Restein Co., Inc., Clement

Paints, Graphite
United States Graphite Co.

Pans, Grinding
Chambers Brothers Co.
Pennsylvania Crusher Co.

Pans, Vacuum
Devine Co., J. P.
Wheeler Condenser & Engineering Co.

Paper Box Machinery
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Riter-Conley Manufacturing Co.
Struthers-Wells Co.

Petroleum Products
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Pittsburgh Valve, Foundry & Construction Co.
Wood & Co., R. D.

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Weller Manufacturing Co.

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Crane Co.
National Tube Co.

Pipe, Welded and Seamless
Best Manufacturing Co.
Crane Co.
National Tube Co.
Pittsburgh Valve, Foundry & Construction Co.

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Wyckoff & Son Co., A.

Pipe, Wrought Iron
Best Manufacturing Co.
Crane Co.
Mark Manufacturing Co.
National Tube Co.

Pipe Bends and Pipe Bending
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Best Manufacturing Co.
Crane Co.
National Pipe Bending Co.
Pittsburgh Valve, Foundry & Construction Co.

Pipe Coils, Covering, Cutters, Fittings, Joints, etc.
(See Coils, Covering, Cutters, Fittings, Joints, etc., Pipe)

Pipe Cutting and Threading Machines
Crane Co.

Pipe Joint Clamps
Yarnall-Waring Co.

Pipe Joint Compound
Crane Co.
United States Graphite Co.

Pipe Threading Devices
(See Thread Cutting Tools)

Piston Valves
(See Valves, Piston)

Planer Attachments
Cincinnati Planer Co.

Planer Tools
(See Tools, Planer)

Planers, Metal
Cincinnati Planer Co.
Detrick & Harvey Machine Co.

Planers, Open Side
Detrick & Harvey Machine Co.

Planers, Variable Speed
Cincinnati Planer Co.

Plate Glass Finishing Machinery
(See Glass Finishing Machinery, Plate)

Plate Metal Work
(See Metal Work, Plate)

Plumbago
(See Graphite)

Pneumatic Conveying Systems
(See Conveying Systems, Pneumatic)

Pneumatic Despatch Tubes
(See Tubes, Pneumatic Despatch)

Pneumatic Pumping Systems
(See Air Lift Pumping Systems)

Pneumatic Tools
Ingersoll-Rand Co.

Polishing Machinery and Supplies
Builders Iron Foundry

Poppet Valve Engines
(See Engines, Poppet Valve)

[illegible] Slag, etc.

[illegible]

Power Transmission Machinery
American Pulley Co.
American Tool & Mach[illegible]
Brown Co., A. & F.
Caldwell & Son Co., H. W.
Falk Co.
Falls Clutch & Machine[illegible]
[illegible]
Hill Clutch Co.
Hyatt Roller Bearing Co.
Link-Belt Co.
New Departure Manu[illegible] Co.
Nordyke & Marmon Co.
Reeves Pulley Co.
Royersford Foundry & [illegible] Co.
Saginaw Manufacturing [illegible]
Stephens-Adamson Mfg. [illegible]
[illegible] Manufacturing [illegible]
Wood's Sons Co., T. B.

Pressed Steel Products
See Shapes, Pressed Steel.

Presses, Bending
Bliss Co., E. W.

Presses, Drop
Bliss Co., E. W.

Presses, Continuous Screw
[illegible]

Presses, Foot and Hand
Bliss Co., E. W.

Presses, Forging
[illegible]

Presses, Hydraulic
[illegible]

Pulleys, Sash
American Pulley Co.

Pulleys, Steel
American Pulley Co.
Caldwell & Son Co., H. W.

Pulleys, Wood
Caldwell & Son Co., H. W.
Hill Clutch Co.
Reeves Pulley Co.
Saginaw Manufacturing Co.
Stephens-Adamson Mfg. Co.

Pulverizers
Brown Co., A. & F.
Nordyke & Marmon Co.
[illegible] Crusher Co.
Williams Patent Crusher & Pulverizer Co.

Pump Governors, Valves, etc.
See Governors, Valves, etc., Pump.

Pumping Machinery
Blake & Knowles Steam Pump Works.
Cameron Steam Pump Works, A. S.
[illegible] Pump Co.
[illegible] Pump & Mfg. Co., Ltd.
[illegible] Co.
[illegible] Centrifugal Pump & Machinery Co.
[illegible] W. & B.
[illegible] Manufacturing Co.
[illegible] Engine Works.
[illegible] Manufacturing Co.
[illegible] Co., William E.
[illegible] Condenser & Engineering Co.
[illegible] R. D.
Worthington, Henry R.

Pumps, Air
Blake & Knowles Steam Pump Works.
Cameron Steam Pump Works, A. S.
[illegible] Manufacturing Co.
[illegible]
[illegible] Condenser & Engineering Co.
[illegible] Manufacturing Co., C. H.
Worthington, Henry R.

Pumps, Ammonia
Blake & Knowles Steam Pump Works.
[illegible] Machine Co., Henry

Pumps, Boiler Feed
Blake & Knowles Steam Pump Works.
Cameron Steam Pump Works, A. S.
[illegible] Co.
[illegible] W. & B.
[illegible] Manufacturing Co.
[illegible] Manufacturing Co., C. H.
Worthington, Henry R.

Pumps, Centrifugal
Cameron Steam Pump Works, A. S.
[illegible] Centrifugal Pump & Machinery Co.
[illegible] W. & B.
[illegible] Manufacturing Co.
[illegible] Works.
[illegible] Works.
[illegible] & Engineering Co.
[illegible] Co., C. H.

Pumps, Condensation, with Automatic Receivers
Blake & Knowles Steam Pump Works
Chicago Pump Co.
Wheeler Manufacturing Co., C. H.
Worthington, Henry R.

Pumps, Deep Well
Blake & Knowles Steam Pump Works
Cameron Steam Pump Works, A. S.
Darling Pump & Mfg. Co., Ltd.
Deming Co.
Douglas, W. & B.
Goulds Manufacturing Co.
Ingersoll-Rand Co.
Morris Machine Works
National Brake & Electric Co.
Worthington, Henry R.

Pumps, Dredging
Morris Machine Works
Wood & Co., R. D.

Pumps, Dry Vacuum
(See Pumps, Vacuum)

Pumps, Electric
Cameron Steam Pump Works, A. S.
Chicago Pump Co.
Deming Co.
Douglas, W. & B.
Goulds Manufacturing Co.
Morris Machine Works
Quimby, Inc., William E.
Wood & Co., R. D.
Worthington, Henry R.

Pumps, Hand
Deming Co.
Douglas, W. & B.
Goulds Manufacturing Co.

Pumps, Hydraulic Pressure
Blake & Knowles Steam Pump Works
Cameron Steam Pump Works, A. S.
Goulds Manufacturing Co.
Morris Machine Works
Olsen Testing Machine Co., Tinius
Riehlé Bros. Testing Machine Co.
Wood & Co., R. D.
Worthington, Henry R.

Pumps, Oil
Blake & Knowles Steam Pump Works
Bowser & Co., Inc., S. F.
Cameron Steam Pump Works, A. S.
Deming Co.
Goulds Manufacturing Co.
Quimby, Inc., William E.
Richardson-Phenix Co.
Roots Co., P. H. & F. M.
Wood & Co., R. D.
Worthington, Henry R.

Pumps, Oil, Force Feed
Detroit Lubricator Co.
Greene, Tweed & Co.
Hills-McCanna Co.
Lunkenheimer Co.
McCord Manufacturing Co.
Madison-Kipp Lubricator Co.
Pickering Governor Co.
Richardson-Phenix Co.

Pumps, Power
Blake & Knowles Steam Pump Works
Cameron Steam Pump Works, A. S.
Deming Co.
Douglas, W. & B.
Goulds Manufacturing Co.
Wood & Co., R. D.
Worthington, Henry R.

Pumps, Rotary
Douglas, W. & B.
Goulds Manufacturing Co.
Roots Co., P. H. & F. M.
Wilbraham-Green Blower Co.

Pumps, Self-Registering Hand and Power Driven
Bowser Co., Inc., S. F.

Pumps, Screw
Quimby, Inc., William E.

Pumps, Spray
Deming Co.
Douglas, W. & B.

Pumps, Steam
Blake & Knowles Steam Pump Works
Cameron Steam Pump Works, A. S.
Morris Machine Works
Nordberg Manufacturing Co.
Wheeler Condenser & Engineering Co.
Wheeler Manufacturing Co., C. H.
Worthington, Henry R.

Pumps, Sump
Chicago Pump Co.
Douglas, W. & B.
Goulds Manufacturing Co.
Morris Machine Works
Quimby, Inc., William E.
Wood & Co., R. D.

Pumps, Tank
Blake & Knowles Steam Pump Works
Chicago Pump Co.
Douglas, W. & B.
Goulds Manufacturing Co.
Quimby, Inc., William E.
Wheeler Manufacturing Co., C. H.
Wood & Co., R. D.
Worthington, Henry R.

Pumps, Turbine
Cameron Steam Pump Works, A. S.
Chicago Pump Co.
D'Olier Centrifugal Pump & Machine Co.
Morris Machine Works
Wheeler Condenser & Engineering Co.
Wood & Co., R. D.
Worthington, Henry R.

Pumps, Vacuum
Blake & Knowles Steam Pump Works
Cameron Steam Pump Works, A. S.
Devine Co., J. P.
Goulds Manufacturing Co.
Nash Engineering Co.
Nordberg Manufacturing Co.
Roots Co., P. H. & F. M.
Wheeler Condenser & Engineering Co.
Wheeler Manufacturing Co., C. H.
Wilbraham-Green Blower Co.
Worthington, Henry R.

Punches, Hydraulic
Alliance Machine Co.
Williams, White & Co.
Wood & Co., R. D.

Punches, Multiple
Bliss Co., E. W.
Williams, White & Co.
Wood & Co., R. D.

Punches, Paper
Knowlton Co., M. D.

Punches, Power
Bliss Co., E. W.

[illegible] & Machine

[illegible]

Punches and Dies

[illegible] & Machine

[illegible]

Punching and Coping Machines

Punching and Shearing Machines

[illegible]

[illegible] Systems.

[illegible]

Recorders, Water Flow
Yarnall-Waring Co.

Reels, Metal
American Pulley Co.
Mossberg Co., Frank

Refrigerating Machinery
De La Vergne Machine Co.
Vogt Machine Co., Henry

Regulators, Blower
Davis Regulator Co., G. M
D'Este Co., Julian
Foster Engineering Co
Tagliabue Manufacturing Co., C. J

Regulators, Damper
Davis Regulator Co., G. M
D'Este Co., Julian

Regulators, Electric
[illegible] Electric Co.

Regulators, Flow
Davis Regulator Co., G. M

Regulators, Pressure
[illegible] Steam Specialty Co
[illegible]
Davis Regulator Co., G. M
[illegible]
[illegible] Specialty Co.
[illegible] Manufacturing Co.

Regulators, Pump
[illegible] Pump

Regulators, Temperature
[illegible] Steam Specialty Co.
[illegible]

[illegible]

Rolls, Rubber Covered
Boston Belting Co.
Goodrich Co., B. F.

Rolls, Sand, Chilled and Steel
Seaman, Sleeth Co.

Roofing
Texas Co.

Rope, Hoisting
Broderick & Bascom Rope Co.
Clyde Iron Works
Hunt Co., Inc., C. W.
Leschen & Sons Rope Co., A.
Roebling's Sons Co., John A.
Spencer Wire Co.

Rope, Manila, Sisal, Jute and Hemp
Broderick & Bascom Rope Co.
Leschen & Sons Rope Co., A.

Rope, Transmission
American Steel & Wire Co.
Broderick & Bascom Rope Co.
Caldwell & Son Co., H. W.
Hunt Co., Inc., C. W.
Leschen & Sons Rope Co., A.
Roebling's Sons Co., John A.
Spencer Wire Co.
Weller Manufacturing Co.

Rope, Wire
American Steel & Wire Co.
Broderick & Bascom Rope Co.
Clyde Iron Works
Leschen & Sons Rope Co., A.
Roebling's Sons Co., John A.
Spencer Wire Co.

Rope Drives
Brown Co., A. & F.
Caldwell & Son Co., H. W.
Falls Clutch & Machinery Co.
Hill Clutch Co.
Weller Manufacturing Co.
Wood's Sons Co., T. B.

Rubber Goods, Mechanical
Boston Belting Co.
Goodrich Co., B. F.
Jenkins Bros.
Restein Co., Inc., Clement

Salt Making Machinery
Willcox Engineering Co., Inc.

Sand Blast Apparatus
De La Vergne Machine Co.
Ingersoll-Rand Co.
Lunkenheimer Co.

Sand Mixing Machines
(See Mixing Machines, Sand)

Sash Operating Devices
Drouvé Co., G.

Sawing Machines, Metal
Ajax Manufacturing Co.
Vulcan Engineering Sales Co.

Saws, Power Hack
Vulcan Engineering Sales Co.

Scales, Automatic
Automatic Weighing Machine Co.
Conveying Weigher Co.
Richardson Scale Co.

Screens, Revolving
Caldwell & Son Co., H. W.
Link-Belt Co.
Robins Conveying Belt Co.
Stephens-Adamson Mfg. Co.
Weller Manufacturing Co.
Williams Patent Crusher & Pulverizer Co.

Screens, Shaking
Caldwell & Son Co., H. W.
Link-Belt Co.
Robins Conveying Belt Co.
Stephens-Adamson Mfg. Co.
Williams Patent Crusher & Pulverizer Co.

Screws, Machine
American Screw Co.

Screws, Wood, Iron, Brass, etc.
American Screw Co.

Screw Cutting Dies
(See Dies, Screw and Thread Cutting)

Screw Jacks
(See Jacks, Screw)

Screw Machines, Automatic
Windsor Machine Co.

Screw Machines, Automatic, Multiple Spindle
Windsor Machine Co.

Screw Machines, Hand
Acme Machine Tool Co.
Jones & Lamson Machine Co.
Warner & Swasey Co.
Windsor Machine Co.

Screw Steel
Columbia Steel & Shafting Co.
Union Drawn Steel Co.
Wheelock, Lovejoy & Co.

Sealing Machines, Carton
Automatic Weighing Machine Co.

Separators, Ammonia
De La Vergne Machine Co.

Separators, Oil
Baragwanath & Son, Wm.
Boylston Steam Specialty Co.
Crane Co.
De La Vergne Machine Co.
National Pipe Bending Co.
Wheeler Condenser & Engineering Co.

Separators, Oil and Gas
Petroleum Iron Works Co.

Separators, Steam
American District Steam Co.
Baragwanath & Son, Wm.
Best Manufacturing Co.
Boylston Steam Specialty Co.
Crane Co.
D'Este Co., Julian
Hardie-Tynes Manufacturing Co.
National Pipe Bending Co.
Nicholson & Co., W. H.
Pittsburgh Valve, Foundry & Construction Co.

Set Collars
(See Collars, Shafting)

Sewage, Ejectors
(See Pumps, Sump)

Shaft Turning Lathes
(See Lathes, Shaft Turning)

Shafting
American Tool & Machine Co.
Brown Co., A. & F.
Caldwell & Son Co., H. W.
Columbia Steel & Shafting Co.
Falls Clutch & Machinery Co.
Hill Clutch Co.
Nordyke & Marmon Co.
Stephens-Adamson Mfg. Co.
Union Drawn Steel Co.
Weller Manufacturing Co.
Wheelock, Lovejoy & Co.
Wood's Sons Co., T. B.

Shafting, Flexible
Chicago Flexible Shaft Co.

Shakers, Pneumatic Sand
Vulcan Engineering Sales Co.

Shaking Grates
(See Grates, Shaking)

Squeezers, Hand and Power
Vulcan Engineering Sales Co.

Stacks, Steel
(See Chimneys, Steel)

Stack Linings, Hollow
(See Linings, Hollow Stack)

Stamps and Dies, Steel
Bliss Co., E. W.
Mossberg Co., Frank

Stampings, Sheet Metal
Mossberg Co., Frank
Root Co., C. J.
Willcox Engineering Co., Inc.

Standpipes
Kennicott Co.
Petroleum Iron Works Co.
Riter-Conley Manufacturing Co.

Steam Engines, Separators, Shovels, Traps, etc.
(See Engines, Separators, Shovels, Traps, etc., Steam)

Steam Heating Circulators
(See Circulators, Steam Heating)

Steam Specialties
American Blower Co.
American District Steam Co.
Best Manufacturing Co.
Boylston Steam Specialty Co.
Crane Co.
Davis Regulator Co., G. M.
D'Este Co., Julian
Foster Engineering Co.
Golden-Anderson Valve Specialty Co.
Hills-McCanna Co.
Lunkenheimer Co.
Morehead Manufacturing Co.
Nason Manufacturing Co.
Nicholson & Co., W. H.
Penberthy Injector Co.
Pittsburgh Valve, Foundry & Construction Co.

Steel, Alloy
Columbia Steel & Shafting Co.
Wheelock, Lovejoy & Co.

Steel, Bright Finished
Columbia Steel & Shafting Co.
Union Drawn Steel Co.

Steel, Cold Drawn
Colonial Steel Co.
Columbia Steel & Shafting Co.
Union Drawn Steel Co.

Steel, Cold Rolled
Columbia Steel & Shafting Co.
Union Drawn Steel Co.
Wheelock, Lovejoy & Co.

Steel, Electrical Sheet
Wheelock, Lovejoy & Co.

Steel, High Speed
Braeburn Steel Co.
Colonial Steel Co.
Wheelock, Lovejoy & Co.

Steel, Hot and Cold Rolled Strip
Wheelock, Lovejoy & Co.

Steel, Nickel
Colonial Steel Co.
Union Drawn Steel Co.

Steel, Open Hearth
Braeburn Steel Co.
Colonial Steel Co.
Union Drawn Steel Co.

Steel, Self-Hardening
Braeburn Steel Co.

Steel, Spring
Braeburn Steel Co.
Colonial Steel Co.

Steel, Tool
Braeburn Steel Co.
Colonial Steel Co.
Wheelock, Lovejoy & Cc

Steel, Vanadium
Colonial Steel Co.
Union Drawn Steel Co.

Steel Plate Construction
Bigelow Co.
Burhorn Co., Edwin
Heine Safety Boiler Co.
Keeler Co., E.
Kennicott Co.
Koven & Brother, L. O.
Milwaukee Boiler Co.
Mohr & Sons, John
O'Brien Boiler Works Co., John
Petroleum Iron Works Co.
Riter-Conley Manufacturing Co.
Struthers-Wells Co.
Wetherill & Co., Inc., Robt.
Wood & Co., R. D.

Sterilizers
Koven & Brother, L. O.
Mohr & Sons, John

Stills
Milwaukee Boiler Co.
Struthers-Wells Co.

Stocks and Dies
Crane Co.
Mark Manufacturing Co.
Toledo Pipe Threading Machine Co.

Stokers
Detroit Stoker Co.
Green Engineering Co.
Illinois Stoker Co.
Laclede-Christy Clay Products Co.
Model Stoker Co.
Murphy Iron Works

Stokers, Chain Grate
Green Engineering Co.
Illinois Stoker Co.
Laclede-Christy Clay Products Co.

Stokers, Inclined Grate
Detroit Stoker Co.
Model Stoker Co.
Murphy Iron Works

Stoves, Drying
Drouvé Co., G.

Stoves, Hot Blast
Mohr & Sons, John

Strainers, Water
Boylston Steam Specialty Co.
Pittsburgh Valve, Foundry & Construction Co.
Simplex Valve & Meter Co.

Structural Steel Work
Riter-Conley Manufacturing Co.

Sugar Machinery
Hooven, Owens, Rentschler Co.
Wood & Co., R. D.

Superheaters, Air
Power Specialty Co.

Superheaters, Steam
Heine Safety Boiler Co.
Power Specialty Co.

Switches, Electric
General Electric Co.
National Brake & Electric Co.

Switches and Frogs, Railroad
Falk Co.

Switchboards
General Electric Co.

Synchronous Converters
(See Converters, Synchronous)

Tachometers
Veeder Manufacturing Co.

[illegible]
[illegible]

Tanks ([illegible], [illegible], Steel, Oil and Water)
Bigelow Co.
Burhorn Co., Edwin
[illegible] Boiler Co.
[illegible] Co., E.
Kennicott Co.
[illegible] & Brother, J. [illegible]
Milwaukee Boiler Co.
Mohr & Sons, John
O'Brien Boiler Works Co., [illegible]
Petroleum Iron Works Co.
Riter-Conley Manufacturing Co.
Struthers-Wells Co.
Vogt Machine Co., Henry
Wood & Co., R. D.

Tanks, Aluminum
[illegible]

Tanks, Gas
[illegible]
[illegible]
[illegible]

Tanks, Copper
[illegible]
[illegible]

Tanks, Storage
Burhorn Co., Edwin
Bowser & Co., Inc., S. F.
Kennicott Boiler Co.
Milwaukee Boiler Co.
Petroleum Iron Works Co.
Riter-Conley Manufacturing Co.
Struthers-Wells Co.
Willcox Engineering Co., Inc.

Tanks, Welded
Devine Co., J. P.
Mohr & Sons, John
Struthers-Wells Co.

Tapping Attachments
Geometric Tool Co.
McCrosky Reamer Co.
Modern Tool Co.

Tapping Machines
Geometric Tool Co.
Modern Tool Co.

Tapping Machines, Multiple Head
Williams, White & Co.

Taps, Collapsing
Geometric Tool Co.

Taps and Dies
Geometric Tool Co.
Modern Tool Co.

Telphers
(See Tramrail Systems, Overhead)

Temperature Regulators
(See Regulators, Temperature)

Testing Machines
Olsen Testing Machine Co., Tinius
Riehle Bros. Testing Machine Co.

Thermometers
American Steam Gauge & Valve Mfg. Co.
Tagliabue Manufacturing Co., C. J.

Thread Cutting Tools
Crane Co.
Geometric Tool Co.
Ideal Tool & Manufacturing Co.
Jones & Lamson Machine Co.
Mark Manufacturing Co.
Modern Tool Co.
Toledo Pipe Threading Machine Co.

Tinware Machinery
Bliss Co., E. W.

Tools, [illegible]
[illegible]

Tools, Brass-Working Machine
Turner & Swasey Co.

Tools, Lathe
[illegible] Machine Tool Co.

Tools, Planer
[illegible] Planer Co.

Tools, Railroad Track
[illegible] Co.

Tools, Small
(See Machinists Small Tools)

Towers, Transmission
Riter-Conley Manufacturing Co.

Track, Industrial
Hunt Co., Inc., C. W.

Track, Portable
Hunt Co., Inc., C. W.

Track Work, Special
Buda Co.

Tramrail Systems, Overhead
Brown Hoisting Machinery Co.
Link-Belt Co.
Northern Engineering Works

Tramways, Bridge
Brown Hoisting Machinery Co.
Hunt Co., Inc., C. W.
Link-Belt Co.
[illegible] Conveying Belt Co.

Tramways, Wire Rope
American Steel & Wire Co.
Broderick & Bascom Rope Co.
[illegible] Works
Leschen & Sons Rope Co., A.
Roebling's Sons Co., John A.

Transformers, Electric
General Electric Co.

Transmission Machinery
(See Power Transmission Machinery)

Traps, Condenser
Morehead Manufacturing Co.

Traps, Radiator
Dunham Co., C. A.

Traps, Return
American Blower Co.
Boylston Steam Specialty Co.
Crane Co.
D'Este Co., Julian
Morehead Manufacturing Co.
Nason Manufacturing Co.

Traps, Steam
American Blower Co.
American District Steam Co.
American Steam Gauge & Valve Mfg. Co.
Boylston Steam Specialty Co.
Crane Co.
Davis Regulator Co., G. M.
D'Este Co., Julian
Dunham Co., C. R.
Golden-Anderson Valve Specialty Co.
Jenkins Bros.
Kelly & Jones Co.
Morehead Manufacturing Co.
Nason Manufacturing Co.
Nicholson & Co., W. H.
Pittsburgh Valve, Foundry & Construction Co.
Pratt & Cady Co.
Sturtevant Co., B. F.
Webster & Co., Warren

Traps, Vacuum
American Blower Co.
Crane Co.
Dunham Co., C. A.
Morehead Manufacturing Co.

Treating Machines, Paper and Cardboard
Knowlton Co., M. D.

Trolleys, I-Beam
Brown Hoisting Machinery Co.
Link-Belt Co.
Northern Engineering Works
Vulcan Engineering Sales Co.

Trolley Wheels
(See Wheels, Trolley)

Trucks, Electric
Elwell-Parker Electric Co.

Trucks, Industrial
Elwell-Parker Electric Co.

Trucks, Railroad Freight
Elwell-Parker Electric Co.

Tube Cutters
(See Cutters, Pipe and Tube)

Tube Rolling Machines, for Paper
Knowlton Co., M. D.

Tubes, Boiler
Mark Manufacturing Co.
National Tube Co.

Tubes, Condenser
Aluminum Co. of America
Badger & Sons Co., E. B.
Bridgeport Brass Co.

Tubes, Pneumatic Despatch
Lamson Co.

Tubing, Aluminum
Aluminum Co. of America

Tubing, Fibre
American Vulcanized Fibre Co.

Tubing, Flexible Metal
American Metal Hose Co.

Tubing, Iron and Steel
Kelly & Jones Co.

Tubing, Rubber
Boston Belting Co.
Goodrich Co., B. F.

Tubing, Seamless, Brass and Copper
American Brass Co.
Best Manufacturing Co.
Bridgeport Brass Co.
Crane Co.

Tubing, Seamless, Cold Drawn
American Brass Co.
Best Manufacturing Co.
Bridgeport Brass Co.
National Tube Co.

Tubing, Seamless, Steel
Best Manufacturing Co.
National Tube Co.

Tumbling Barrels
(See Barrels, Tumbling)

Turbines, Hydraulic
Jolly, J. & W.
Morris Co., I. P.

Turbines, Steam
General Electric Co.
Sturtevant Co., B. F.

Turbo-Generators
General Electric Co.
Sturtevant Co., B. F.

Turnbuckles
Cleveland City Forge & Iron Co.
Russell, Burdsall & Ward Bolt and Nut Co.

Turntables
Hunt Co., Inc., C. W.
Northern Engineering Works

Turrett Machines
Acme Machine Tool Co.
American Tool & Machine Co.
Jones & Lamson Machine Co.
Warner & Swasey Co.
Windsor Machine Co.

Uniflow Engines
(See Engines, Uniflow)

Unions
Best Manufacturing Co.
Crane Co.
Illinois Malleable Iron Co.
Jefferson Union Co.
Kelly & Jones Co.
Lunkenheimer Co.
McNab & Harlin Manufacturing Co.
Mark Manufacturing Co.
National Tube Co.
Pittsburgh Valve, Foundry & Construction Co.

Unloaders, Ballast
Marion Steam Shovel Co.

Upsetting Machines
Ajax Manufacturing Co.
Williams, White & Co.

Vacuum Drying Apparatus
(See Dryers, Vacuum)

Vacuum Heating Systems
(See Heating Systems, Vacuum)

Vacuum Pans, Pumps, Traps, etc.
(See Pans, Pumps, Traps, etc., Vacuum)

Valve Balls
Auburn Ball Bearing Co.
Boston Belting Co.
Goodrich Co., B. F.
Lunkenheimer Co.

Valve Boxes
Darling Pump & Mfg. Co., Ltd.
Illinois Malleable Iron Co.
Ludlow Valve Manufacturing Co.
Pratt & Cady Co.
Wood & Co., R. D.

Valve Discs
Allan & Son, A.
American Vulcanized Fibre Co.
Boston Belting Co.
Goetze Gasket & Packing Co.
Goodrich Co., B. F.
Hills-McCanna Co.
Jenkins Bros.

Valves, Air, Automatic
Davis Regulator Co., G. M.
Dunham Co., C. A.
Illinois Malleable Iron Co.
Jenkins Bros.
Smith Co., H. B.

Valves, Air Operating
National Brake & Electric Co.

Valves, Air Relief
Crane Co.
Ludlow Valve Manufacturing Co.
McNab & Harlin Manufacturing Co.
Simplex Valve & Meter Co.

Valves, Altitude
Golden-Anderson Valve Specialty Co.
Simplex Valve & Meter Co.

Valves, Ammonia
Crane Co.
De La Vergne Machine Co.
Jenkins Bros.
Kelly & Jones Co.
Ludlow Valve Manufacturing Co.
Lunkenheimer Co.
Nason Manufacturing Co.
Pratt & Cady Co.
Vogt Machine Co., Henry

[illegible]

Condenser & Engineer-

Manufacturing Co.

Manufacturing Co.

Steam Specialty Co.

ator Co., G. M.

eering Co.

Valve Specialty

Valve Manufacturing

Valve, Foundry &

eering Co., Inc.

Manufacturing Co.

Manufacturing

Foundry &

Steam Co.

Manufacturing

Co. Ltd.

[illegible]

National Tube Co.
Nelson Valve Co.
Penberthy Injector Co.
Pittsburgh Valve, Foundry & Construction Co.
Pratt & Cady Co.

Valves, Hose
Crane Co.
Jenkins Bros.
Ludlow Valve Manufacturing Co.
Lunkenheimer Co.
McNab & Harlin Manufacturing Co.
National Tube Co.
Nelson Valve Co.
Pratt & Cady Co.

Valves, Hydraulic
Best Manufacturing Co.
Chapman Valve Manufacturing Co.
Crane Co.
Ludlow Valve Manufacturing Co.
McNab & Harlin Manufacturing Co.
Nelson Valve Co.
Pittsburgh Valve, Foundry & Construction Co.
Wood & Co., R. D.

Valves, Hydraulic Operating
Best Manufacturing Co.
Pittsburgh Valve, Foundry & Construction Co.
Wood & Co., R. D.

Valves, Piston
American Balance Valve Co.

Valves, Non-Return
Crane Co.
Davis Regulator Co., G. M.
Foster Engineering Co.
Golden-Anderson Valve Specialty Co.
Jenkins Bros.
Lunkenheimer Co.
Nelson Valve Co.
Pittsburgh Valve, Foundry & Construction Co.

Valves, Plug
Homestead Valve Manufacturing Co.
Pittsburgh Valve, Foundry & Construction Co.

Valves, Pop Safety
American Steam Gauge & Valve Mfg. Co.
Crane Co.
Detroit Lubricator Co.
Lunkenheimer Co.
National Brake & Electric Co.

Valves, Pump
American Vulcanized Fibre Co.
Boston Belting Co.
Goodrich Co., B. F.
Goulds Manufacturing Co.
Hill Pump Valve Co.
Jenkins Bros.
Mark Manufacturing Co.
Wood & Co., R. D.

Valves, Radiator
American District Steam Co.
Crane Co.
Detroit Lubricator Co.
Jenkins Bros.
Kelly & Jones Co.
Lunkenheimer Co.
McNab & Harlin Manufacturing Co.
National Tube Co.
Pratt & Cady Co.

Valves, Reducing
American District Steam Co.
Boylston Steam Specialty Co.
Davis Regulator Co., G. M.
D'Este Co., Julian
Dunham Co., C. A.
Foster Engineering Co.
Golden-Anderson Valve Specialty Co.
National Brake & Electric Co.

Valves, Regulating
Boylston Steam Specialty Co.
Crane Co.
Davis Regulator Co., G. M.
D'Este Co., Julian
Foster Engineering Co.
Golden-Anderson Valve Specialty Co.
Lunkenheimer Co.

Valves, Relief (Water)
American Steam Gauge & Valve Mfg. Co.
Crane Co.
D'Este Co., Julian
Foster Engineering Co.
Golden-Anderson Valve Specialty Co.
Ludlow Valve Manufacturing Co.
Lunkenheimer Co.
Wood & Co., R. D.

Valves, Rubber
Boston Belting Co.

Valves, Safety
American Steam Gauge & Valve Mfg. Co.
Boylston Steam Specialty Co.
Crane Co.
Detroit Lubricator Co.
Jenkins Bros.
Lunkenheimer Co.
McNab & Harlin Manufacturing Co.
National Brake & Electric Co.
National Tube Co.
Pratt & Cady Co.

Valves, Slide
American Balance Valve Co.

Valves, Steel (Superheated Steam)
Best Manufacturing Co.
Chapman Valve Manufacturing Co.
Crane Co.
Foster Engineering Co.
Golden-Anderson Valve Specialty Co.
Jenkins Bros.
Ludlow Valve Manufacturing Co.
Lunkenheimer Co.
Nelson Valve Co.
Pittsburgh Valve, Foundry & Construction Co.
Pratt & Cady Co.

Valves, Stop and Check
Crane Co.
Davis Regulator Co., G. M.
Foster Engineering Co.
Golden-Anderson Valve Specialty Co.
Jenkins Bros.
Lunkenheimer Co.
Nelson Valve Co.
Pittsburgh Valve, Foundry & Construction Co.
Pratt & Cady Co.

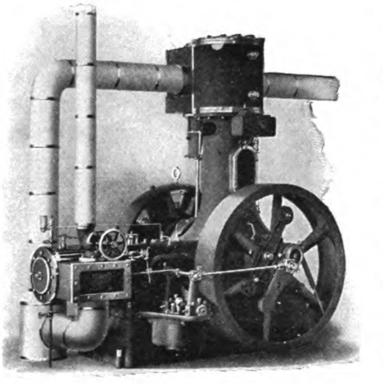
Valves, Throttle
Best Manufacturing Co.
Crane Co.
Detroit Lubricator Co.
Golden-Anderson Valve Specialty Co.
Jenkins Bros.
Ludlow Valve Manufacturing Co.
Lunkenheimer Co.
McNab & Harlin Manufacturing Co.

AMERICAN ENGINE & ELECTRIC CO.

BOUND BROOK, N. J.

ALL KINDS OF HIGH GRADE SIMPLE AND COMPOUND STEAM ENGINES, DIRECT-CONNECTED UNITS, MOTORS AND GENERATORS.

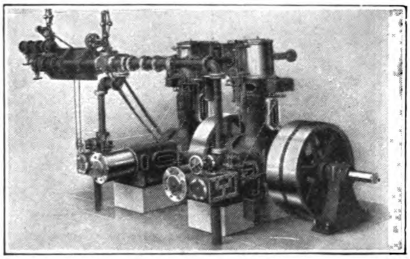
THE AMERICAN-BALL ANGLE COMPOUND ENGINE



The American-Ball Angle Compound Engine has all of the advantages possessed by every American engine, an automatic system of lubrication, sensitive balanced automatic governor, adjustable cross-head guides, attached indicator reducing motion, high-class workmanship, etc. Besides these, some of the special advantages inherent to the angle construction are as follows:

With the cylinders at right angles, practically perfect balancing is secured. The Angle construction, with its four impulses per revolution, gives a practically uniform torque, making this engine especially adaptable for driving alternators which are to be run in parallel. Small floor space. The Angle Compound Engine gets twice as much power on the same amount of floor space as does a simple engine.

THE AMERICAN-BALL FOUR-CYLINDER PAPER MILL ENGINE



has the following important advantages:

A speed range of 8: 1 and even 10: 1, permitting of direct connection to the variable speed shaft.

Elimination of shut-downs to change speed.

Excellent speed regulation secured by the four-cylinder construction of the engine and by a special stabilized governor which prevents surging in speed and insures even thickness of paper.

Ask for literature on Paper Mill Engines and Engines for Isolated plants, also our report on cost of Isolated Plant Power.

DIMENSIONS OF AMERICAN-BALL ANGLE COMPOUND ENGINES

FOR BELTED SERVICE								FOR DIRECT-CONNECTED SERVICE								
Horsepower	Cylinder Diameters and Stroke	Revolutions per Minute	Floor Space		Steam and Exhaust Pipes		Shipping Weight Pound	K. W.	Cylinder Diameters and Stroke	Revolutions per Minute	Floor Space		Steam and Exhaust Pipes		Shipping Weight in Pounds	
			Length	Width	Steam	Exhaust					Length	Width	Steam	Exhaust	Direct Connected Engine	Engine and Dynamo
120	12 & 19 x 10	325	103	85	4	6	12,000	75	12 & 19 x 10	325	103	107½	4	6	12,200	17,000
160	13 & 20 x 11	300	111	93½	4	7	14,900	100	13 & 20 x 11	300	111	112	4	7	15,200	21 100
250	16 & 25 x 12	285	125	110	6	9	23,000	150	16 & 25 x 12	285	125	120½	6	9	21,400	32,200
325	18 & 28 x 14	260	138	126	6	10	30,000	200	18 & 28 x 14	260	138	132½	6	10	27,900	40,000
400	20 & 32 x 15	250	145	141	7	12	37,600	250	20 & 32 x 15	250	145	156½	7	12	31,700	45,000
500	22 & 34 x 16	240	154	158	8	12	45,000	300	22 & 34 x 16	240	154	165	8	12	39,200	
650	25 & 38 x 18	225	164	182	9	14	50,000	400	25 & 38 x 18	225	164	174	9	14	51,000	

100

BALL ENGINE CO.

ERIE, PENNSYLVANIA

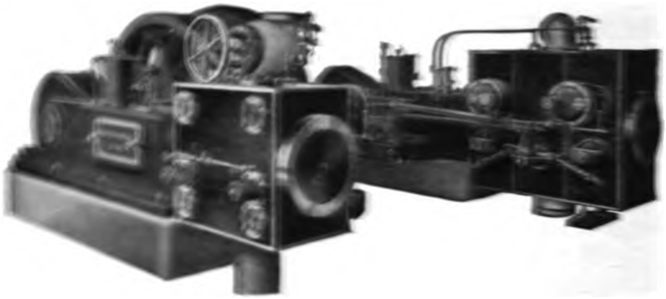
CORLISS-VALVE AND SINGLE-VALVE ENGINES; HORIZONTAL AND VERTICAL SIDE-CRANK ENGINES; TANDEM AND CROSS-COMPOUND SINGLE-VALVE ENGINES, CORLISS-VALVE COMPOUND AND SINGLE-CYLINDER ENGINES.

HIGH-SPEED CORLISS ENGINES

The feature which distinguishes this engine from other four-valve shaft governor engines is the patented non-detaching valve gear, which imparts the same movement to the valves that the trip cut-off of the slow-speed engine produces by picking up and dropping them. This permits the use of the best form of valve and the valves are given the movement necessary for the greatest economy and tightness.

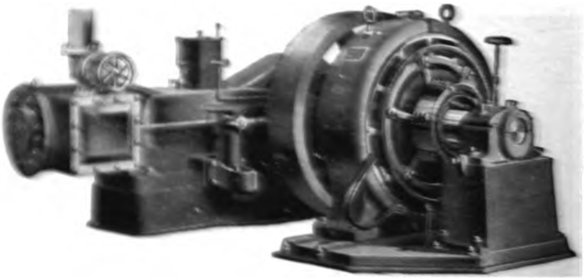
Built in sizes from [illegible] h.p. to 1200 h.p. in the single-cylinder and cross-compound types.

These engines excel in economy and regulation and are especially adapted for electric service.



SINGLE-VALVE AUTOMATIC ENGINES

These engines are the result of a long experience in building engines for electric service. They are superior in design and construction. The regulation and economy are the best of their type.

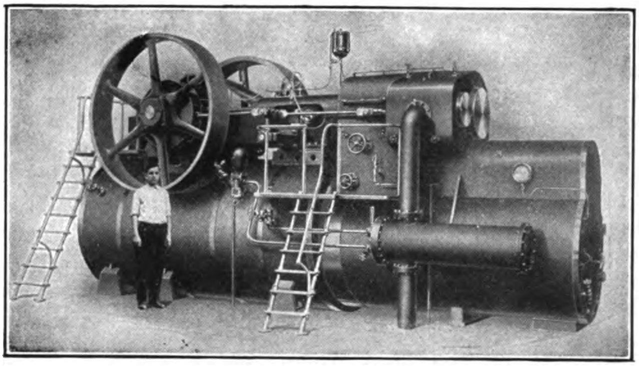


Built in sizes from 25 h.p. to 800 h.p. in the single-cylinder, tandem-compound and cross-compound types.

BUCKEYE ENGINE COMPANY

SALEM, OHIO

STEAM ENGINES, GAS ENGINES AND LOCOMOBILES



Buckeyemobile

THE AMERICAN LOCOMOBILE

A self-contained Power Plant of Highest Efficiency.

The Buckeye-mobile is a complete high-grade steam plant in a single compact unit. A compound engine mounted on the boiler produces power on less than 10 lbs. of steam per horse power hour. This economy is obtained through the effectual utilization of high pressure superheated steam and by the elimination of radiation losses which are prevented by enclosing the cylinders, the superheater and all piping, valves and fittings in the smoke hood through which the flue gases circulate before going to the stack. A pump, direct driven from the main engine, feeds the boiler through a feed water heater in the exhaust line.

Buckeye-mobiles normally operate condensing, the air pump being driven by the main engine, but they show excellent economy when running non-condensing and should be so operated when the exhaust steam can be used for heating purposes.

THE SUPERIORITY OF THE BUCKEYE-MOBILE.

ECONOMY OF FUEL—From one to one and half pounds of coal (depending on the quality) produce a horse power hour, or a kilowatt hour is generated on 1¾ to 2½ lbs. of coal.

EASY SUPERVISION—It is easily handled. The small quantity of fuel used reduces the labor of firing to a minimum. Every part is easily accessible.

USES ANY FUEL—The Buckeye-mobile is a universal fuel user. Steam coal of all grades, fuel oil, gas or refuse may be utilized by proper modifications of the furnace.

UNIVERSAL APPLICATION—It is suitable for all situations where a cheap reliable power is desired, such as electric stations, pumping plants, factories, office buildings, irrigation plants and flour mills.

DEPENDABILITY—Reliable operation is insured by its simplicity. There are but few moving parts and the nature of every element, for example, the removable corrugated furnace boiler, plain continuous tubular superheater, single piston valve engine, flanged valves, pipe fittings of steel and valveless vacuum pump, contributes to the very lowest maintenance and depreciation costs.

ECONOMY IN SMALL PLANTS—The usual small steam plant is notoriously wasteful of fuel. The Buckeye-mobile, however, even in the smallest sizes, produces power on less fuel than the largest compound condensing plants of the usual design using saturated steam.

TEST BEFORE SHIPMENT—Each machine is tested in the factory. The purchaser may witness the test and order the unit shipped only when all guarantees have been fully met.

Built in nine sizes from 75 H. P. to 600 H. P.

Complete information in Bulletin 10-B sent on request.

HARDIE-TYNES MANUFACTURING COMPANY

BIRMINGHAM, ALABAMA

CORLISS ENGINES, AUTOMATIC ENGINES, HOISTING ENGINES, DIRECT CONNECTED ENGINES, SLIDE VALVE ENGINES, AIR COMPRESSORS, SPECIAL MACHINERY, HEAVY CASTINGS.

HEAVY DUTY CORLISS ENGINES

Tangye Frame Type

Designed for steam pressures of 150 lb. or more, to run at moderate speeds. Built in sizes ranging from 16 x 36 in., 114 i.h.p., to 34 x 60 in., 1255 i.h.p.

HEAVY DUTY CORLISS ENGINES

Imperial Frame Type

These engines are also designed for steam pressures of 150 lb. or more, but may be [illegible] somewhat higher rotative speeds than the Tangye Frame Machines. Sizes range from 8 x 24 in., 21 i.h.p., to [illegible] x 30 in., [illegible] i.h.p.

HEAVY GIRDER FRAME CORLISS ENGINES

These engines are especially suitable for manufacturing plants having moderate steam pressures and uniformly applied [illegible] designed for steam pressures [illegible] and are built in sizes ranging from [illegible] in., [illegible] i.h.p., to 26 x 48 in., [illegible]

COMPOUND CORLISS ENGINES

Cross-compound Tandem Types

[illegible] Tangye, Imperial or [illegible]. Sizes range from 400 [illegible] to 700 i.h.p., [illegible] respectively.

DIRECT CONNECTED CORLISS ENGINES

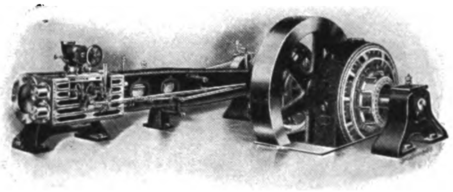
[illegible] Tangye and Imperial [illegible] either direct or [illegible] connections, from 50 [illegible]

THE FITCHBURG STEAM ENGINE CO.

FITCHBURG, MASS.

MANUFACTURERS OF STEAM ENGINES FOR USE UNDER EVERY SORT OF CONDITION.

"THE FITCHBURG"—DIRECT-CONNECTED—GIRDER BED

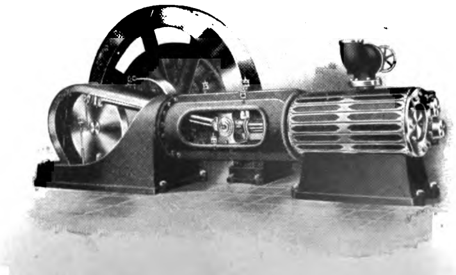


Sizes 7″ by 18″ to 22″ by 42″. Revolutions 80 to 250.

D. Con. or Belted	Girder Bed as above	To	300	H.P.
" " "	Tangye Bed as below	"	800	"
" " "	Tandem Girder	"	300	"
" " "	Tandem Tangye	"	800	"
" " "	Cross Girder	"	750	"
" " "	Cross Tangye	"	1500	"
" " "	High-Speed Horizontals	"	250	"
" " "	Single Cylinder Vertical	"	400	"
" " "	Steeple Comp'd Vertical	"	400	"

Details for any size given on application.

"THE FITCHBURG"—DIRECT-CONNECTED—TANGYE BED

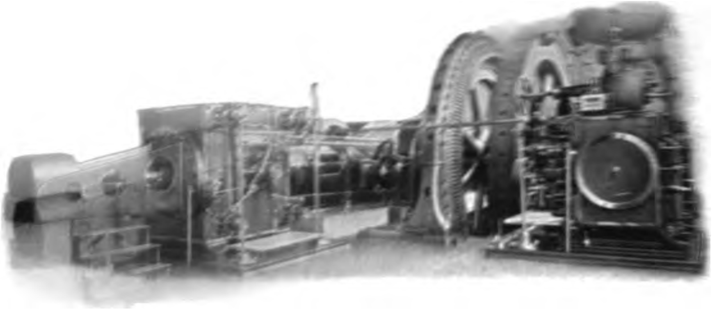


Sizes 12″ by 18″ to 30″ by 48″. Revolutions 80 to 250.

[illegible] OWENS, RENTSCHLER COMPANY

[illegible]

[illegible] MEDIUM SPEED WITH RELEASING
[illegible] ENGINES WITH NON-RELEASING GEAR
[illegible] ENGINES, AIR AND GAS COMPRESSORS.



[illegible] Direct-Connected Corliss Engine

HAMILTON CORLISS HEAVY DUTY ENGINES WITH ONE-PIECE FRAME FOR DIRECT CONNECTION TO GENERATOR OR BELT DRIVE FOR HEAVY MILL SERVICE.

[illegible] designed [illegible] demands of modern practice; built for high steam [illegible] equipped with sensitive governor, insuring extremely close regulation. Every [illegible] and stability.

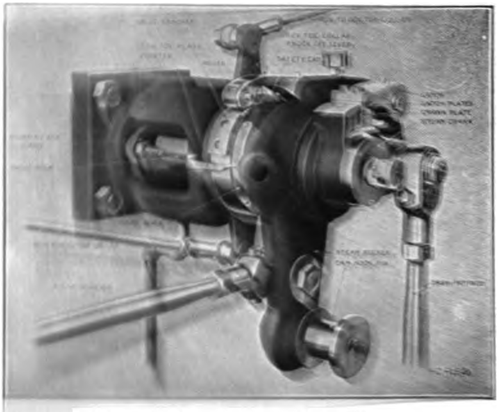
Steam and exhaust passages a[illegible] large, permitting low steam velocity. Indicator cards showing horizontal [illegible] volumetric clearance small, reducing steam consumption. Steam [illegible] are usually operated by separate eccentrics, giving long range cut-off. [illegible] motion of all parts small, consistent with good practice.

The valve gear as shown is of [illegible] type and is compact and simple, having very few parts. It operates [illegible] speeds up to and including 160 RPM and being a gravity gear the lat[illegible] the necessity of springs. The parts subject to stresses, such as latch and cam levers, are steel forgings, absolutely safe against breakage, and the entire valve gear is carried close to the cylinder, avoiding excessive overhang.

Frame is of the Rolling Mill type and cast in one piece; it has a broad footing on the foundation for entire length and extends around and under crank disc.

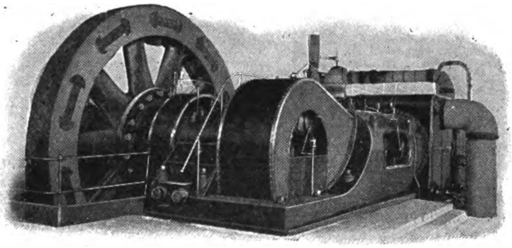
Special tools are used for machining large castings, such as cylinder or frame, at one setting, insuring perfect alignment.

We build our heavy duty and high speed engines in both the horizontal and vertical single cylinder or compound design.



[illegible] Gravity Valve Gear

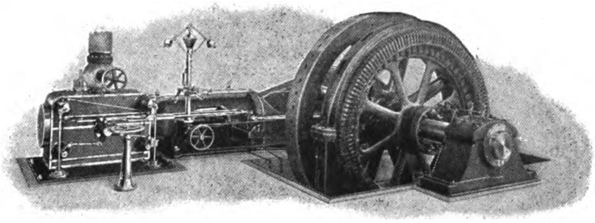
THE HOOVEN, OWENS, RENTSCHLER COMPANY



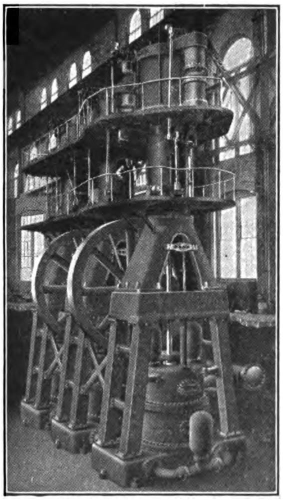
Tandem Compound Corliss Rolling Mill Engine

TANDEM COMPOUND HAMILTON HIGH SPEED CORLISS ENGINE WITH VARIABLE SPEED VALVE GEAR

This engine is equipped with positive driven valve gear and link motion with variable speed hand regulating cut-off mechanism and is arranged for direct connection to centrifugal pump or blower. It is provided with a fly ball governor, attached to a quick closing auxiliary throttle valve. The frame used in this engine is of same design as our heavy duty engine and the speed is usually from 125 to 175 RPM.



Single Cylinder Direct-Connected Corliss Engine



23 Million Gallon High Duty Pumping Engine

SINGLE CYLINDER AND COMPOUND HAMILTON HIGH SPEED CORLISS ENGINE WITH NON-RELEASING VALVE GEAR

This engine is adapted for all speeds from 125 to 200 RPM. It is made from our regular Corliss patterns, with changes in the valve gears to meet the demand for higher speeds than are possible with the releasing gear and dash pots.

This engine is entirely in a class by itself and is different from the so-called "four valve engine." The valve movement is as near the regular Corliss movement as it is possible to make, without a hook and dash pot release. The mechanism is such that the valves move during the balanced period, giving highest economy and least wear. The rocker arms, etc., are as light as possible consistent with strength, reducing inertia forces to a minimum.

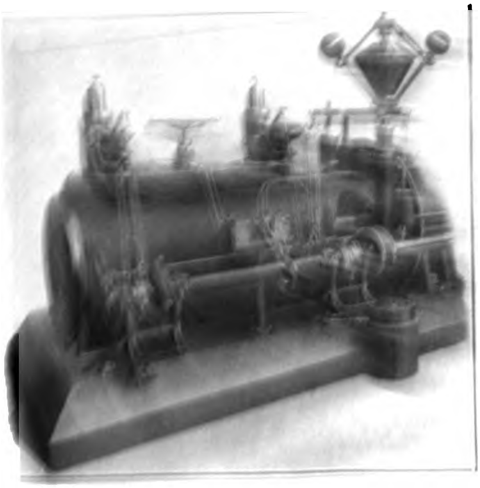
The valve stems are equipped with special spherical metallic packing of our own design (patented), eliminating the use of stuffing boxes. The entire valve gear sets close to the cylinder, as shown in the illustration.

The governor used on this engine is of the shaft type (patented) and is different from any other manufactured. It is arranged so that the governor weights, springs and eccentrics are in perfect gravity balance at all speeds, making it possible to equalize the steam distribution in each end of the cylinder. Another feature of importance is that the spring is attached to the weight in such a manner that its force and the centrifugal force of the weight are nearly opposite, making the resultant force and the wear on the weight pin very small indeed.

Every detail of our engines receives great care and is fully described in our bulletins issued at frequent intervals.

[illegible] NORDBERG [illegible] COMPANY

[illegible] DESIGNERS AND BUILDERS OF
[illegible] UNIFLOW ENGINES, POPPET
[illegible] BLOWING ENGINES, HOISTING
[illegible] AND STAMPS.

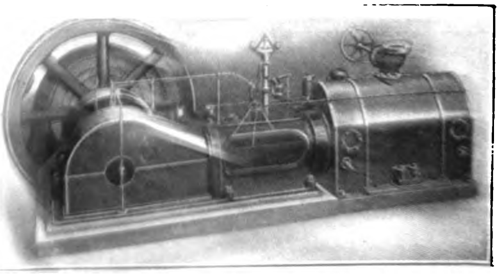


NORDBERG EQUILIBRIUM POPPET VALVE ENGINES.

[illegible] the equilibrium [illegible] engines [illegible] over [illegible] commercial [illegible] poppet valve en[illegible] steam [illegible] pressure and full super[illegible] poppet valve [illegible] an indep[illegible] demonstrated [illegible] test [illegible] the famous [illegible] Compressor [illegible] used for [illegible] pres[illegible] which receives steam [illegible] pressure is fitted with [illegible] poppet valves. A short time ago the [illegible] pressure was turned on [illegible], and not the slightest [illegible] steam could be noticed in [illegible], demonstrating fully the absolute tightness of the valves, even after eight years of service.

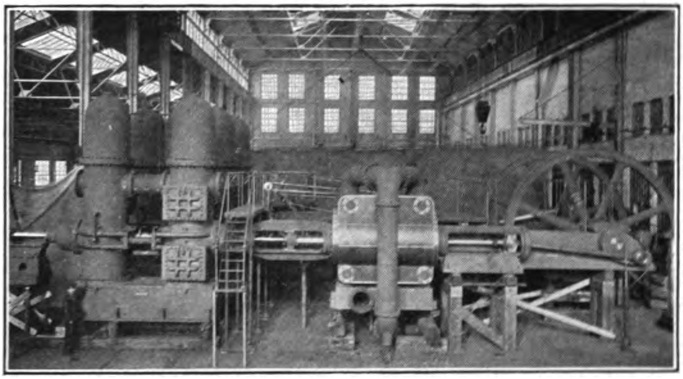
NORDBERG UNIFLOW ENGINES.

[illegible] Nordberg Uniflow Engine [illegible] steam consumption [illegible] actual comparison with the performance of the best known [illegible] of American Turbines, the Nordberg Uniflow Engine not only [illegible] the percent increase in steam consumption with ind[illegible] turbine.



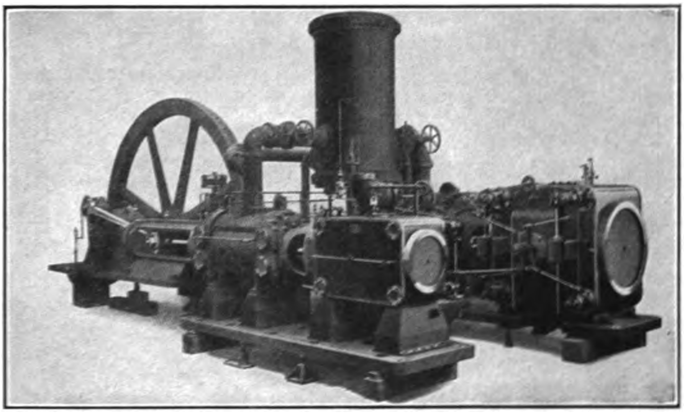
We are building complete [illegible] existing engines with Uniflow cylinders.

THE NORDBERG MFG. COMPANY

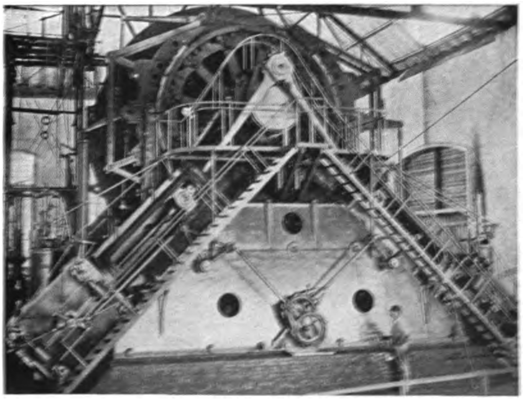


NORDBERG PUMPING ENGINES: The photograph shows a Nordberg Pumping Engine, built for the Utah Copper Company, capacity 10,000 gallons per minute against 265 ft. head.

The Nordberg Mfg. Company builds the highest duty compound, triple and quadruple expansion pumping engines with or without the Nordberg regenerative feed water heating system with which the highest steam economies in the world have been obtained.



NORDBERG COMPRESSORS: The above photograph shows a Nordberg horizontal cross compound two-stage full Corliss Air Compressor. Besides full Corliss Compressors, which are built in the largest sizes and have shown, for example at the Champion Copper Co. Mine, the highest recorded steam economy in the world, the Nordberg Mfg. Company also build a line of small compressors ("SC" Type) in capacities from 300 ft. up for belt drive. The compressors are compactly designed, fool-proof, enclosed and self-contained with automatic lubrication.



HOISTS: This photograph shows the largest hoist in the world, furnished to the Tamarack Mining Co., Mich. The Nordberg Mfg. Co. has made more hoists for great depths than all other builders in the U. S. combined.

Other products of this Company include Nordberg Steam Stamps, Blowing Engines, Condensers, Vacuum Pumps and special machinery.

McINTOSH & SEYMOUR CO.

[illegible]

STEAM ENGINES

[illegible] COMPOUND ENGINES

[illegible] H. P. M.

[illegible] type of engine recently [illegible] is the result of [illegible] [illegible] taining uniform valve [illegible] makes it possible to [illegible] speeds without sacrificing [illegible] economy, durability.

[illegible]

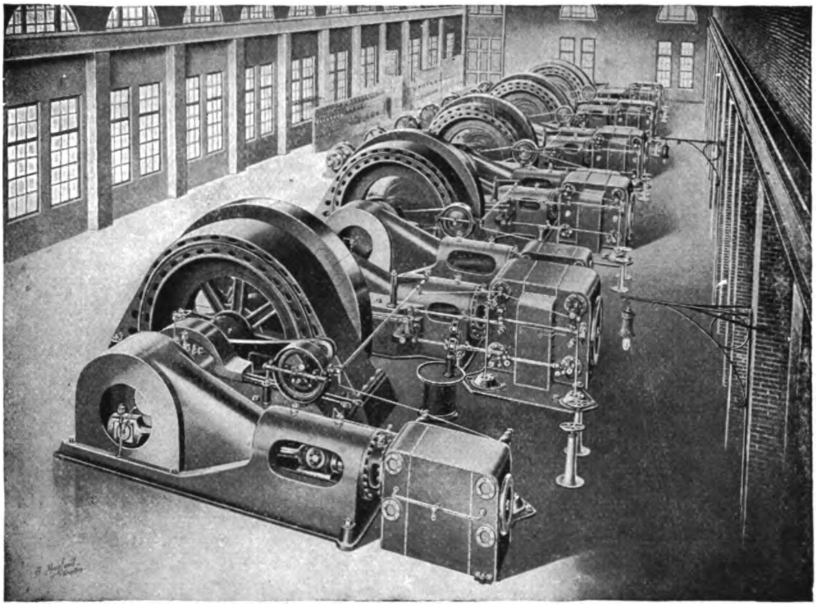
[illegible] H. P.

[illegible] H. P.

PROVIDENCE ENGINEERING WORKS

PROVIDENCE, R. I.

RICE & SARGENT CORLISS ENGINES, SPECIAL MACHINERY AND MACHINE PARTS TO ORDER, REPAIRS TO ALL TYPES OF ENGINE, COMPLETE RECORDS, DRAWINGS AND PATTERNS OF IMPROVED GREENE ENGINE.



The Rice & Sargent Corliss Engines are built in all usual types, for all purposes for which a high grade Corliss engine is required. They are built in all sizes, from 150 Horse Power to the largest desired. They are designed throughout for speeds considerably higher than are usual for other Corliss engines, making them especially suited to direct-connected electrical work.

Rice & Sargent Corliss Engines are built in one grade only—the same patterns, material and workmanship are used on every engine as on those installed in some of the country's finest steam plants.

Remarkable results have been obtained in a number of very accurate tests as regards steam consumption, regulation and mechanical efficiency.

Bulletins describing the details of construction and the result of tests will be sent to anyone.

Fully equipped separate departments—a competent engineering force—and a corps of trained and efficient workmen is maintained to manufacture special machinery or machine parts of any nature to order.

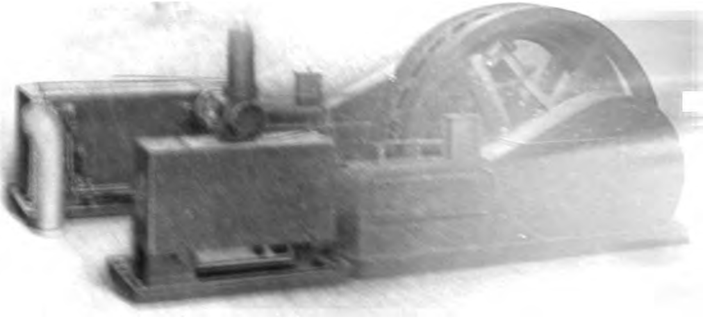
Steam Engines

McINTOSH [illegible]

SINGLE CYLINDER AND TANDEM COMPOUND E

100 to 750 horse power. Speeds up to 257 R. P. M

This is a modern, positive-feed self oiling, enclosed [illegible] introduced with marked success. The extreme simplicity [illegible] improvements suggested by twenty years' experience in [illegible] This makes the engine less expensive and al[illegible] [illegible] the range of sizes to smaller powers and higher s[illegible] [illegible] advantages of this type in the line of [illegible] and good running qualities.



[illegible] COMPOUND ENGINES

[illegible] horse power. Speeds up to [illegible]

[illegible] Engines [illegible]

[illegible] Engines [illegible]

[illegible] Engines [illegible]

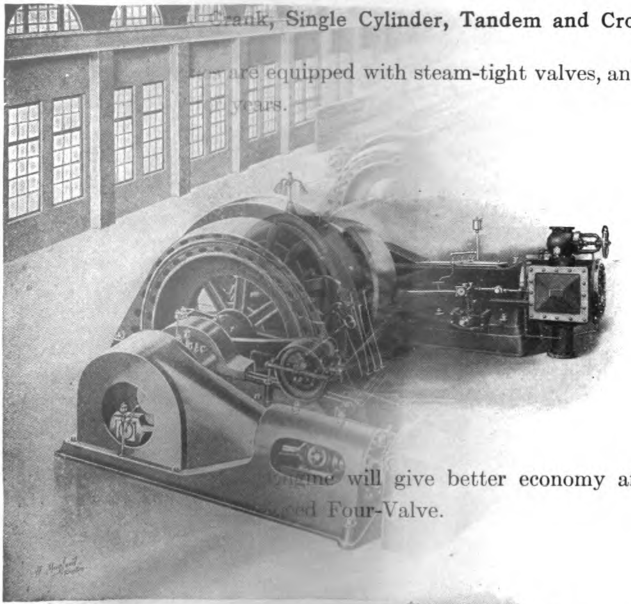
[illegible] High Speed [illegible] Engines [illegible]

PROVIDENCE
SKINNER ENGINE COMPANY

ERIE, PA.

RICE & SARGENT COR Branches in 28 Cities
MACHINE PARTS TO ORDER,
COMPLETE RECORDS, HIGH GRADE AUTOMATIC ENGINES
GREENE ENGINE.

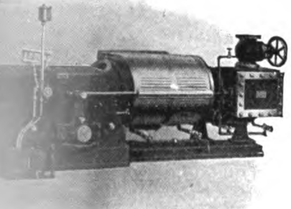
SKINNER ENGINES



Crank, Single Cylinder, Tandem and Cross Compound

are equipped with steam-tight valves, and therefore main-
years.

ngine will give better economy after six months'
ced Four-Valve.



The Rice & Sargent Corliss Engin
for which a high grade Corliss eng
from 150 Horse Power to the large
speeds considerably higher than ar
especially suited to direct-connec

Rice & Sargent Corliss Engines
material and workmanship are u
of the country's finest steam pl

Remarkable results have been
regards steam consumption, reg ounds have established American records

Bulletins describing the detai rteen months after starting, and without
sent to anyone. economies, with 132 pounds steam

Fully equipped separate dep st
corps of trained and efficient
machinery or machine parts o er hour.
hour.

TROY ENGINE & MACHINE CO.

TROY, PENNSYLVANIA

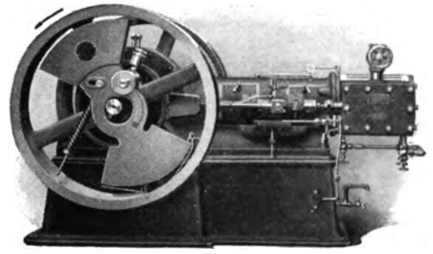
STEAM ENGINES OF THE CENTRE-CRANK TYPE EXCLUSIVELY

Our standard products are given in the list below. Column B gives the maximum usual pressure and Column C the number of sizes made.

Stock Title	B	C
Troy Vertical Automatic Engines	80–160	13
Troy Horizontal Automatic Engines	80–160	8
Troy Vertical Direct-Connected Engines	80–160	13
Troy Horizontal Direct-Connected Engines	80–160	8
Troy Vertical Throttling Engines	80–160	14
Troy Horizontal Throttling Engines	80–160	9
Troy Vertical Low-Pressure Engines	10– 40	10
Troy Horizontal Low-Pressure Engines	10– 40	6

All the above are made either enclosed and self-oiling, or open with gravity lubrication.
Sizes — 2 to 100 H. P.

TROY SELF-OILING ENGINES



Horizontal Automatic Type for Belted Service

The economy of operation and maintenance of Troy Self-Oiling Engines is better than obtained in many common types of steam engines. The original design has proved excellent and progressiveness in important details has made the Troy Engine gratifyingly successful. The following brief mention of construction details are of interest.

Balanced Valves that are built steam tight and remain steam tight. Neither loss by leakage nor expense for repairs.

Long Connecting Rods, lessening the friction on the guides, thus saving power and securing longer life for the bearings.

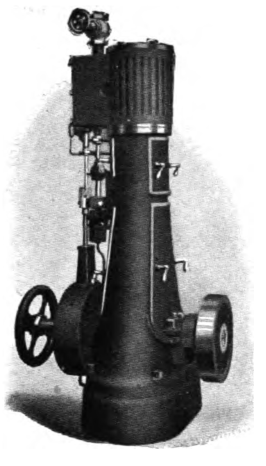
Patent Locking Device for the crank pin bolts, making accurate adjustment easy, and providing strength and security at this important point in the engine.

A Self-Oiling System (patented) that thoroughly lubricates, saves oil and operates automatically. The bearings run in oil, minimizing wear, and the cost of lubrication is less. The oil pump and the check valve are designed especially for this service and are particularly strong features, as they should be.

The Babbitt and the Brass used in bearings are made by Troy formulas which have been worked out to provide the most durable bearings.

Automatic Governor Engines have a regulation which varies less than 2 per cent.

Each order receives personal attention so as to adapt the engine in the nicest possible manner for the service it has to perform. This has particular importance when the engine has special details in construction for direct connected or similar work, and always insures the purchaser getting just the equipment needed.



Special Type of Vertical Throttling for D. C. to Fan or Blower

SKINNER ENGINE COMPANY

ERIE, PA.

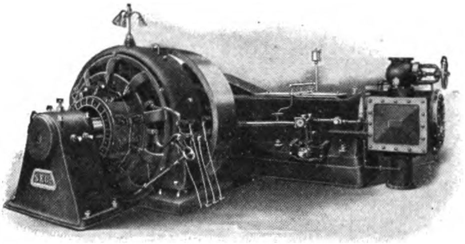
Branches in 28 Cities

BUILDERS OF HIGH GRADE AUTOMATIC ENGINES

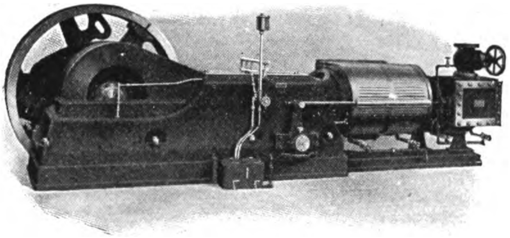
SKINNER ENGINES

Side and Center Crank, Single Cylinder, Tandem and Cross Compound

All Skinner Engines are equipped with steam-tight valves, and therefore maintain their economy for years.



A single-valve Skinner Engine will give better economy after six months' operation than any High Speed Four-Valve.



The Skinner Double-Eccentric Compounds have established American records for economy. Two engines, tested fourteen months after starting, and without re-fitting of valves, showed the following economies, with 132 pounds steam pressure (saturated) and atmospheric exhaust

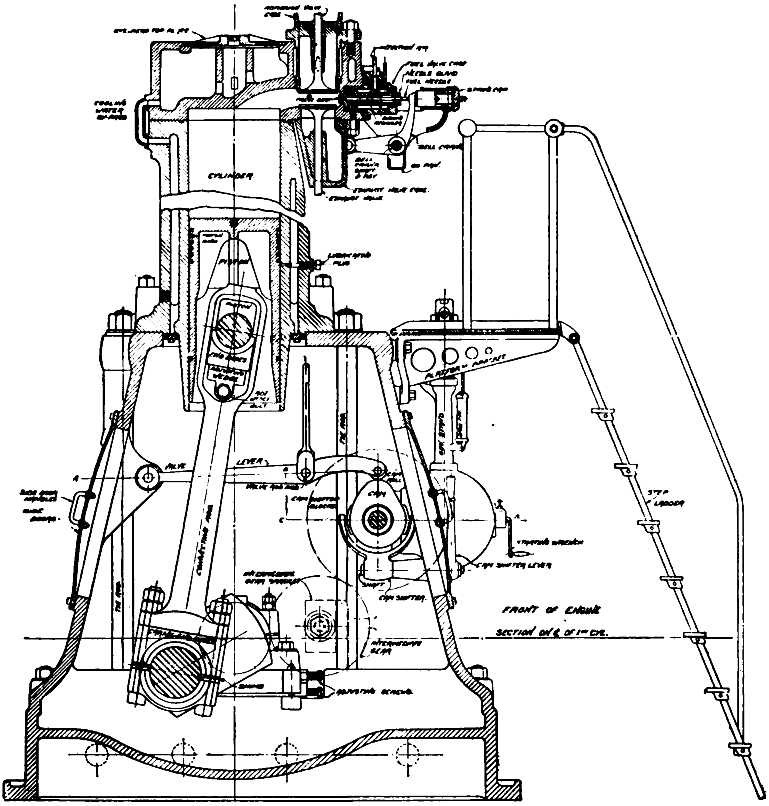
400 H.P., 17.81 pounds per I.H.P. per hour.
320 H.P., 18.13 pounds per I.H.P. per hour.

Tangye design, especially adapted for the requirements of [illegible]
Rolling Mill and other heavy duty service

BUSCH-SULZER BROS.-DIESEL ENGINE COMPANY

ST. LOUIS, U. S. A.

THE DIESEL ENGINE MANUFACTURERS



These engines are the most economical prime movers known.

Use crude or cheapest grade fuel oils or distillates.

Do not require heating up to start—Have no electric or hot tube igniters.

Combustion gradual—no explosion; fuel fed automatically from fuel tank into combustion chamber and amount injected governed by load on engine.

Start cold and pick up full load in 2 or 3 minutes—stopped as readily—cut out stand-by losses—operate in parallel alternating or direct current generators.

Over 70,000 H.P. built in the U. S. and in operation in various lines of industry in 26 States.

Let us figure on your proposition—Record of tests of plants in operation for the asking.

[illegible]

[illegible]

[illegible] OIL ENGINE—DIESEL TYPE

[illegible] I.H.P. Units

[illegible] developed in [illegible] massive struc- [illegible] distributed.— [illegible] thoroughly [illegible] as [illegible]

[illegible] carburetor or mixer.

[illegible]

[illegible] from the Eastern [illegible]

[illegible] to start from a [illegible] No stand- [illegible]

LYONS ATLAS COMPANY

INDIANAPOLIS, INDIANA

ATLAS OIL ENGINES DIESEL TYPE

Vertical, Four-Cycle—300 to 1,000 B. H. P. Class

The highest efficiency known to engineering science.

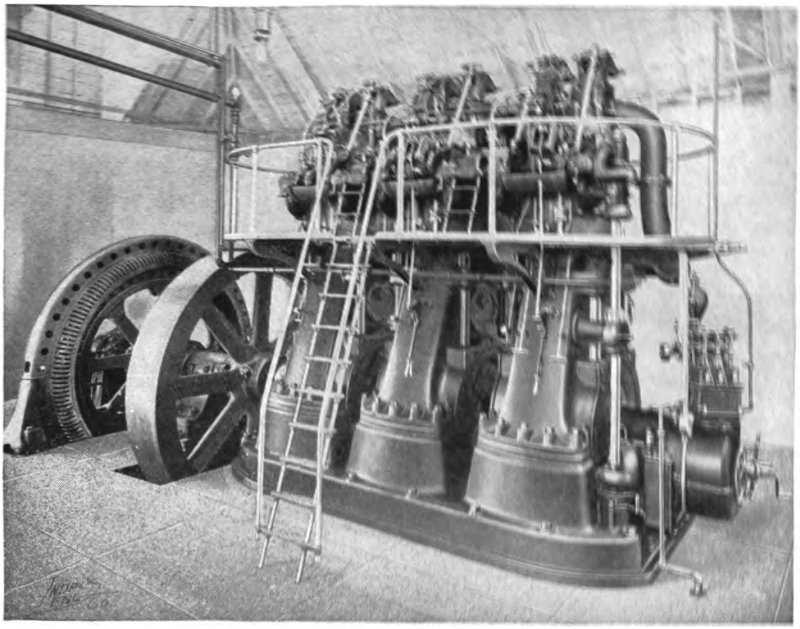
Fuel consumption less than { [illegible] gallon per B. H. P. hour / [illegible] gallon per K. W. hour

Practically the same proportional fuel consumption at half load as at full load.

Regulation and angular variation conform to the exacting requirements of parallel operation in direct-connected 60-cycle alternating current electrical service.

We offer these engines on the merits they have demonstrated in the service of our customers, and guarantee definite results.

Our Bulletin No. 201-H contains much useful data and interesting information.



450 B. H. P. Atlas Oil Engine
Direct-connected to 375 K. V. A., 60-cycle Alternator,
Municipal Water Works and Electric Light Plant, Bryan, Ohio

Water Meters

NATIONAL METER COMPANY

[illegible]

[illegible]

NEW YORK CITY

[illegible]

[illegible] Wabash [illegible]
[illegible]
[illegible]
[illegible]

Cincinnati, 31 W. 3d St.
Los Angeles, 412 S. Main St.
Atlanta, 1st Nat. Bank Bldg.
London, Caxton House

Agencies in every large city throughout the world

MANUFACTURERS OF CROWN, EMPIRE, NASH, GEM, PREMIER, AND EMPIRE COMPOUND WATER METERS

THE CROWN

Is a positive displacement water meter of the rotary piston type. This meter has been made and sold by us for over thirty years. It is substantial, durable and accurate. We make this meter in sizes from 5/8" to 6".

THE EMPIRE

Is a positive displacement water meter of the oscillating piston type. It is the most accurate, durable and generally satisfactory meter manufactured today. Owing to the simple construction of its measuring chamber the accuracy of this meter can be maintained indefinitely at a minimum cost. It is made in sizes from 5/8" to 6".

THE NASH

Is a positive displacement water meter of the disc type. This meter has been on the market for over twenty five years. The reinforced disc, frost proof bottom and simple working parts are a few of its many superior advantages. The meter is made in sizes from 5/8" to 6".

THE GEM

Is a water meter of the velocity or current type and has been made by us since [illegible]. It is intended for services where a large and rapid delivery of water is of special advantage. The Gem has the greatest capacity of any meter of its type on the market. It is made in sizes from 2" to 12".

THE PREMIER

Is a water meter composed of a Venturi Tube and a by pass on which an ac[illegible] is mounted. This meter is intended to meas[illegible] other large services. The Premier is made [illegible]

THE EMPIRE COMPOUND

[illegible] by combining our Empire and Gem meters. It [illegible] large and small flows and will operate most [illegible]. The Empire section is always [illegible] which means automati[illegible] larger than the capacity of the [illegible]

[illegible] STANDARD [illegible]
[illegible] TRIED

[illegible] offer you the

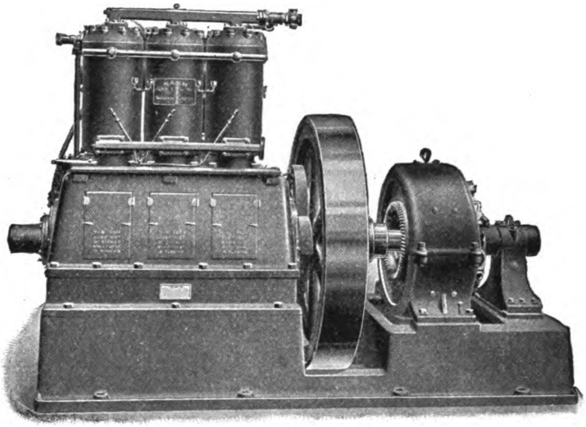
[illegible] METER FOR YOUR SERVICE

NATIONAL METER COMPANY

NASH INTERNAL COMBUSTION ENGINES

to operate on
Illuminating Gas, Gasoline or Producer Gas
Simple, Silent, and Efficient

The valve mechanism of the NASH is external to the engine and conveniently placed so as to be under the eye of the attendant. Grouped with it, is the ignition timing device, the mechanically operated oiling system and the starting mechanism.



All sizes of NASH engines are of the four cycle type and are fitted with throttling or hit and miss governors as may be selected or best suited to the conditions.

The National Meter Company is the originator of the throttling governor for gas engines and the NASH was the first gas engine to be equipped with it.

In regulation, the NASH Gas Engine is on a parity with that of the best steam engines.

Due to its high economy, closeness of regulation and quietness of operation it meets a great range of power requirements.

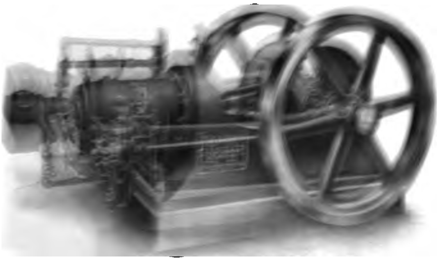
COMPARATIVE COST OF POWER OF VARIOUS TYPES OF ENGINES

Type of Engine	Fuel	Price	Fuel Consumed per B. H. P. per Hour	Cost per H. P. per Hour	Cost 100 H. P. 10 Hrs.
Simple Slide Valve Steam....	Bituminous Coal	$3.50 per ton	8 lbs.	.0124	$12.40
Compound Condensing Corliss	Bituminous Coal	3.00 per ton	3 lbs.	.0045	4.50
Steam Turbine..............	Bituminous Coal	3 00 per ton	3 lbs.	.0045	4.50
Oil Engine	Fuel Oil	.036c. per gal.	1/12 gal.	.003	3.00
Nash Gas Engine...........	Natural Gas	25c. per M.	10 cu. ft.	.0025	2.50
Nash Gas Engine on Producer Gas....................	Coke	5.00 per ton	1¼ lb.	.0031	3.10
Nash Gas Engine on Producer Gas....................	Lignite	1.75 per ton	2 lbs.	.00175	1.75
Nash Gas Engine on Producer Gas....................	Anthracite Buck	4 00 per ton	1 lb.	.002	2.00
Nash Gas Engine...........	Illuminating Gas	75c. per M.	18 cu. ft.	.0135	13.50
Nash Gasoline Engine.......	Gasoline	16c. per gal.	1/10 gal.	.016	16.00
Electric Power.............	....	3c. per KW hr.	....	.0225	22.50

[illegible]

[illegible]

[illegible] ENGINE



[illegible]:

[illegible] operate satisfactorily on ordinary grades of distillates [illegible] To deliver the [illegible] rated Brake Horse Power. To consume not more than the following amounts of fuel per B.H.P. hour:

When running at full load .... .9 lbs.

When running at ¾ load .... 1.12 "

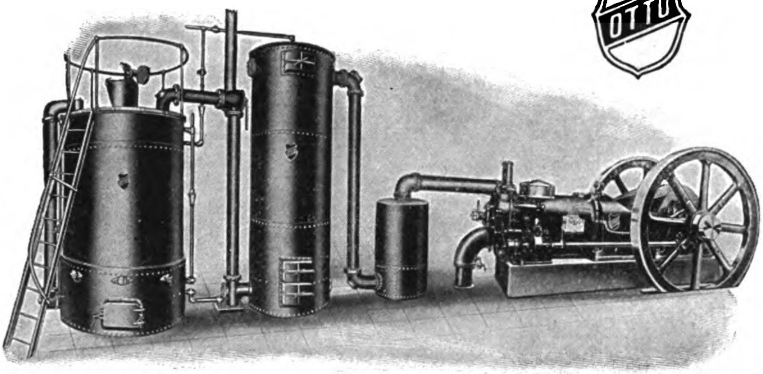
[illegible] .... 1.35 "

[illegible] service where reliability is of [illegible]

THE OTTO GAS ENGINE WORKS

Home Office and Works, PHILADELPHIA, PA.
NEW YORK CHICAGO KANSAS CITY

"OTTO" ENGINES ARE DESIGNED TO OPERATE ON CITY OR NATURAL GAS, PRODUCER GAS, GASOLINE, DISTILLATE AND ALCOHOL. ADAPTED FOR ALL POWER PURPOSES—PUMPING PLANTS—STATIONARY AND PORTABLES, HOISTING RIGS, HIGH AND LOW VOLTAGE ELECTRIC LIGHTING PLANTS. DIRECT-GEARED AIR COMPRESSORS. STATIONARY AND PORTABLES. HEAVY DUTY ENGINES FOR MANUFACTURING INDUSTRIES.



Otto Suction Gas Producer and Latest Throttling Governor Engine

THE OTTO SUCTION GAS PRODUCER

The "Otto" Suction Gas Producer converts the heat of anthracite coal, charcoal, or coke into producer gas or semi-water gas, containing a certain amount of carbon monoxide and hydrogen, and having a heating value of approximately 130 to 140 B.T.U. per cu. ft. The loss due to purifying and cooling of the gas, etc., is only about 20 per cent, so that 80 per cent of the total heating value of the fuel is available for power or heating purposes, as against about 15 to 20 per cent in the average steam plant.

The complete producer consists of three cylindrical tanks; one being the producer proper containing the fire and carrying at the top the evaporator or moistener; the second is the scrubber filled almost to the top with coke, and the third is the gas receiver which acts as a small storage tank for the finished gas.

All precautions have been taken to make "Otto" Gas Producers and Gas Engines absolutely safe and reliable and they are listed and approved by the National Board of Underwriters.

ECONOMY

When using coal of suitable quality the fuel consumption *is guaranteed* not to exceed 1¼ lb. per brake h. p. per hour during full load runs. Actual practice has shown considerably more favorable results, as we have records of many large plants operating on less than one lb. per h. p. hour.

"Otto" horizontal engines are built in all sizes from 4 to 300 h. p.

Bulletins No. 10 and 24 and booklets No. 6 and 8 furnish complete information. Mailed upon request.

[illegible]

[illegible] DIFFERENT TYPES

[illegible]

[illegible] SMITH PRODUCERS OF ALL TYPES

[illegible]

Smith Type B Suction Producers to operate on bituminous fuel

EDGE MOOR IRON COMPANY

EDGE MOOR, DELAWARE

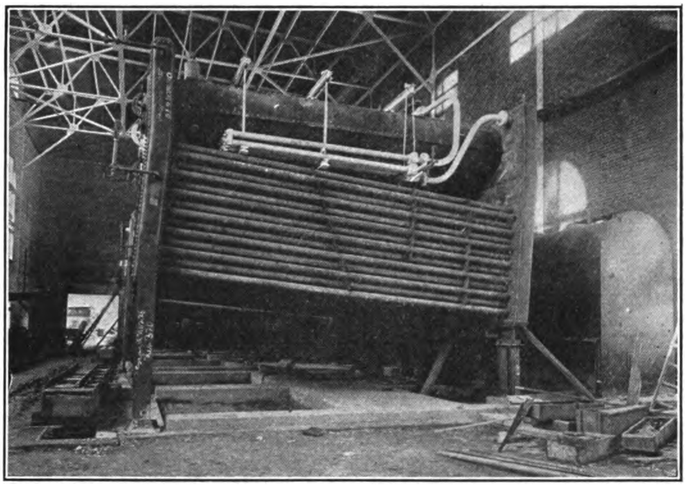
111 Broadway
NEW YORK

79 Milk Street
BOSTON

First Nat'l Bank Bldg.
CHICAGO

Rialto Bldg.
SAN FRANCISCO

BUILDERS OF THE EDGE MOOR WATER TUBE BOILER



Four Pass Edge Moor Boiler Fitted with Superheater

The distinctive feature of the Edge Moor water tube boiler is that the drum opens at both ends directly into extended headers, or water-legs, as shown in the illustration.

The inner cross-sectional area of a header is the same throughout, thus avoiding constricted passages which interfere with free circulation from the tubes to the combined steam and water drum.

It is therefore impossible to split the circulation of water in the tubes, no matter how hard the boiler is fired, thereby permitting tremendous forcing of the boiler without danger of damaging the tubes.

This distinctive construction also gives a greatly increased disengaging surface for the separation of generated steam from water. Furthermore, the drum is horizontal and the steam outlet is on the rear header so that the generated steam, which comes up the front header, must traverse the full length of the drum at a relatively low velocity. Dry steam at all rates of evaporation is thus assured.

These features make the Edge Moor boiler especially suitable for the severe requirements of large central power plants, where a great many have been installed.

The Edge Moor boiler is in successful use with various kinds of grates and stokers, and with miscellaneous coals, crude oil, and other fuels.

The sizes vary from 100 H.P. to 1000 H.P.

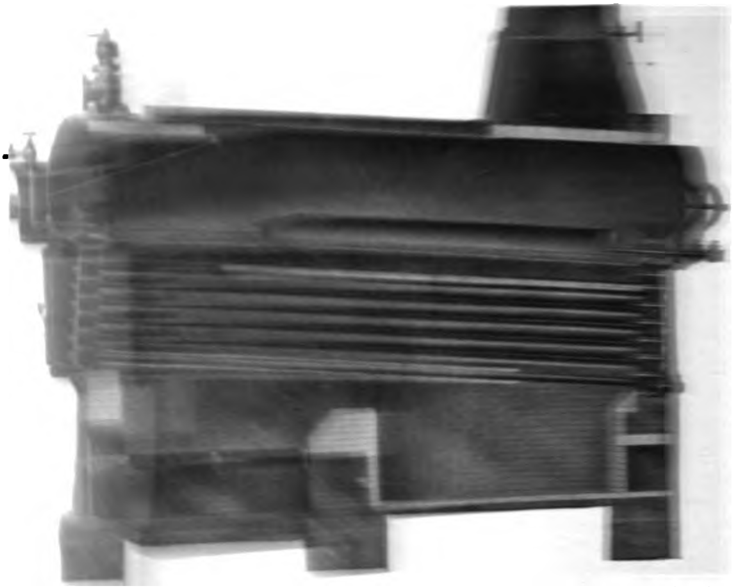
Write our nearest office for further information.

HEINE SAFETY BOILER COMPANY

[illegible]

[illegible] WATER TUBE BOILERS, HEINE PATENT STEAM [illegible]HEATERS, STEEL STACKS, HOUSINGS, FLUES, ETC.

[illegible] HEINE BOILER



[illegible] of steel. The front and rear headers are [illegible] and are [illegible] the combus[illegible] brick baffle [illegible] on the lower row of tubes [illegible] the boiler tubes from the [illegible] the front [illegible] of the upper baffle and [illegible] the steel.

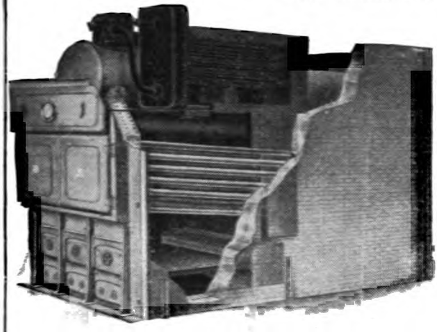
[illegible] the mud drum where the [illegible] is deposited [illegible] water [illegible] the drum as it is heated [illegible] header through the tubes and up the [illegible] for the steam and water is provided by the large throat area at the junction of the [illegible] and the headers. This construction is shown at the left and is [illegible] contrasted with those types of boilers [illegible] the water circulation is badly [illegible].

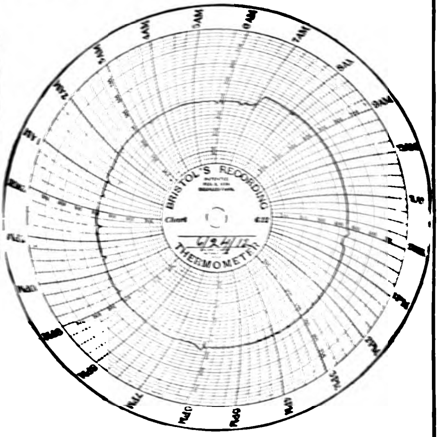
This large throat are [illegible] because the velocity of the [illegible] low and therefore the capacity [illegible] water is a minimum. [illegible] providing a [illegible] The steam [illegible] around the [illegible] plate which may be seen in the [illegible] through the drum.

[illegible] information regarding [illegible] boiler [illegible] of the Heine Boiler send for "[illegible]" and our book "Heine."

HEINE SAFETY BOILER COMPANY

THE HEINE SUPERHEATER





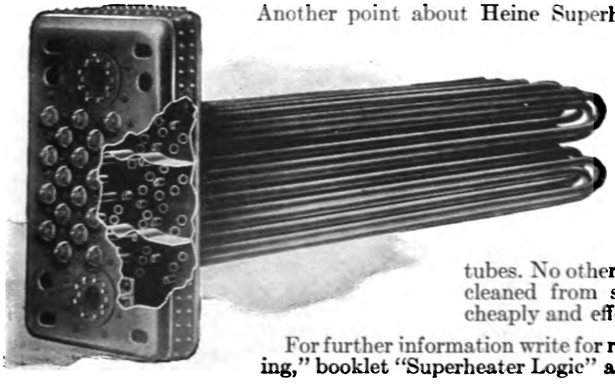
Heine boiler, equipped with a Heine Superheater; chart to right shows the close regulation of superheat temperature obtained.

The Heine Superheater may be installed on any type of boiler in new or old installations. Each unit consists of a header or box into one side of which are inserted U tubes of 1½ inch seamless drawn mild steel tubing expanded into holes provided for them. The interior of the box is divided into three compartments and the steam makes four passes through the tubes.

Heine Superheaters are installed to the side of the boiler drum in a small superheater chamber forming a part of the main boiler setting and communicating with the furnace by a flue through which a small part of the furnace gases flow. The gases make two passes over the superheater tubes flowing out at the front, whence they pass under the boiler drum to the main uptake.

The volume of hot gases is controlled automatically or by hand by a damper in the outlet of the superheater chamber and the temperature of the superheated steam may be regulated to within 5° to 10° of any desired mean. Superheaters equipped with automatic temperature regulators will respond rapidly to any changes and constant superheat will be maintained regardless of variations of furnace temperature or load.

When the load goes off, the superheater damper closes and the superheater tubes act simply as additional steam reservoir space. Flooding of the superheater is unnecessary, with the added and important advantage that no scale-forming impurities are deposited within the tubes.



Another point about Heine Superheaters is that the header box is constructed with hollow stay-bolts, similar to the construction of Heine water legs, and therefore steam nozzles can be readily inserted for cleaning soot from the superheater tubes. No other superheater can be cleaned from soot so quickly, cheaply and effectively.

For further information write for reprint "Superheating," booklet "Superheater Logic" and other literature

THE BIGELOW COMPANY

[illegible] NEW HAVEN, CONN. [illegible]

FIRE TUBE AND WATER TUBE STEAM BOILERS; DIGESTERS, CRYS[illegible] VULCANIZERS, AND HEAVY PLATE STEEL WORK

THE BIGELOW HORNSBY WATER TUBE BOILER

Cross Sectional View Through the Brickwork

Features of the Bigelow-Hornsby Boiler that meet the requirements of Modern Power House Practice.

Unlimited size of units.

Small ground space occupied.

Coldest water meets the coldest gases.

Direct heating surface about four times as great as the average water tube boiler.

All parts, both external and internal, readily accessible.

All boiler tubes perfectly straight.

Circulation of water and liberation of steam uninterrupted.

Very dry steam, also ample room for superheaters when required.

High continuous economy due to extreme cleanliness of the most efficient heating surface.

Arrangement of baffling is unique, causing the gases to pass over the heating surface in thin streams and uniformly at every point.

Furnace arrangement is ideal for securing perfect combustion, as furnace is correctly shaped and of ample size.

[illegible] in construction and in steaming qualities.

[illegible] portion of the boiler proper.

[illegible] workmanship and material in accordance with the most advanced boiler practice.

THE BIGELOW MANNING BOILER

Standard Manning

This type of boiler can be constructed suitable for 200 pounds working pressure or more in units up to 300 H. P. The shell sheets being free from contact with the fire permits the use of any thickness of steel necessary for high pressures. Another feature conducive to safe operation is the firm support of the boiler, which is accomplished in the Bigelow-Manning type by having a firm foundation upon which the cast iron base rests, without relying upon the support of setting walls or expensive structural work.

The economical comparative performance of the Bigelow Manning boiler is remarkable. All radiant heat from the fuel bed is absorbed directly by water-heating surface, the distribution of the furnace gases over the heating surface is practically uniform, the superheat furnished is varied by changing the water level, there are no losses due to the infiltration of air in the setting and stand-by losses are comparatively small, occupying per H. P. much less ground space than other types.

HORIZONTAL RETURN TUBULAR BOILER

I Beam Suspension Type of H. R. T.

The advantages of compactness and efficiency, large direct heating surface, easy cleaning, large liberating surface, perfect circulation and minimum liability and ease of repairs are well known features of this type of boiler.

Our boilers are constructed in the most approved manner, we adopt the very highest type of professional and mechanical service, endeavoring to maintain the highest possible standard of efficiency, and believe our facilities for boiler construction are without a parallel.

E. KEELER COMPANY

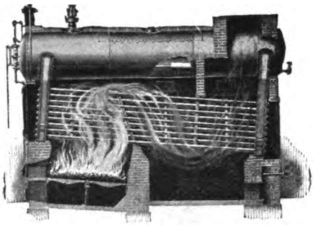
Established 1864

WILLIAMSPORT, PA.

New York Philadelphia Pittsburgh Chicago New Orleans Dallas San Francisco

WATER TUBE, TUBULAR AND MARINE BOILERS. STEEL PLATE WORK

WATER TUBE BOILERS
Standard Type



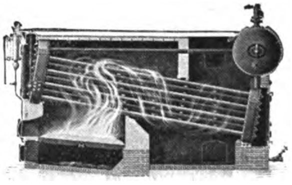
Standard Type Water Tube Boiler

The arrangement of furnace, tubes, headers and drum in the Keeler Water Tube Boiler is efficient, accessible and compact. The superior efficiency of the Keeler Boiler rests upon correct proportions of heating and grate surface for the character of fuel to be burned, ample height of furnace, a superior arrangement of baffle walls and a perfect circulation. Every portion of the heating surface is accessible for both external and internal inspection, making it impossible for soot or scale to accumulate undetected. There is ample room between tubes and drum for inspection or repairs. Special side cleaning doors make it possible to observe the condition of the outside surface of the tubes. There is no part of the interior surface that cannot be examined and cleaned.

Keeler Water Tube Boilers are usually built complete and tested in the shop. This reduces the cost of erection, as the boilers are handled as a unit. It also eliminates the dangers due to careless assembling of boilers in the field and makes the erection merely a matter of placing in position and attaching fittings.

Boilers of 500 H. P. and more must be shipped in a knocked down condition. We are prepared to send erecting engineers to any part of the country to rivet the drums to the headers, expand the tubes and test.

WATER TUBE BOILERS
Cross Drum Type



Cross Drum Type Water Tube Boiler

The Keeler Cross Drum Water Tube Boiler is a modification of the standard design, only in the length and location of the drum and the method of connecting it to the headers. This type was developed to meet the demand for a high grade water tube boiler that could be installed in Office Buildings, School Houses, Churches, Apartment Houses, Hotels and boiler rooms generally where ceiling height is limited or where the boiler must be introduced through narrow passageways or restricted openings.

The pressure parts of the boiler are shipped in a knocked down condition, making it possible to install it without cutting through walls and floors in locations that would be wholly inaccessible for almost any other type of boiler. If boilers are to be exported, the cross drum boiler can be handled at much less expense by steamship companies on account of its reduced bulk in a knocked down condition, and the comparatively small weight of the heaviest piece.

HORIZONTAL RETURN TUBULAR BOILERS

Horizontal Return Tubular Boiler

Our Return Tubular Boiler is the product of fifty years' experience of boiler building. Tube holes are drilled from the solid plate, and not punched small and reamed to size. All seams are thoroughly caulked on the outside, and the end of butt straps are caulked on the inside. Braces are drop forged. Steam outlets, man hole plates, yokes and brackets are of pressed steel.

[illegible] BOILER WORKS CO.

[illegible] MO.

[illegible] IMPROVED O'BRIEN-HAWLEY [illegible]

[illegible] TUBE BOILERS

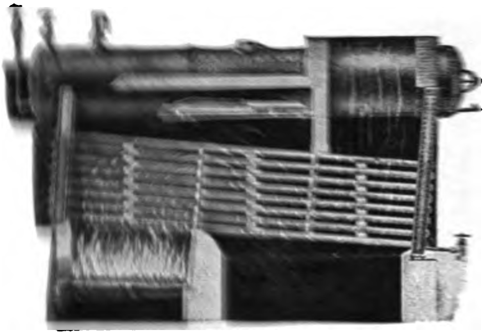
VERTICAL TYPE

[illegible] Vertical Water Tube Boiler was [illegible] simplicity and durability of [illegible] with absolute safety and the [illegible] economy. The complete boiler [illegible] component parts, the drums and [illegible]

[illegible] cylindrical in shape with heads [illegible] to avoid bracing. The [illegible] is made of open hearth homo- [illegible] pounds tensile strength and [illegible] pressure required. Thickness of [illegible]

[illegible] radius at either [illegible] from top to bottom or can [illegible] front or back. [illegible] sufficient area between [illegible] removal or re- [illegible]

[illegible] upper drum, rest- [illegible] on a substantial gallows [illegible] and is suspended abso- [illegible]



[illegible] We can furnish the [illegible]

[illegible] Water Drum is parallel with [illegible]

[illegible] Stacks, etc., and are the [illegible]

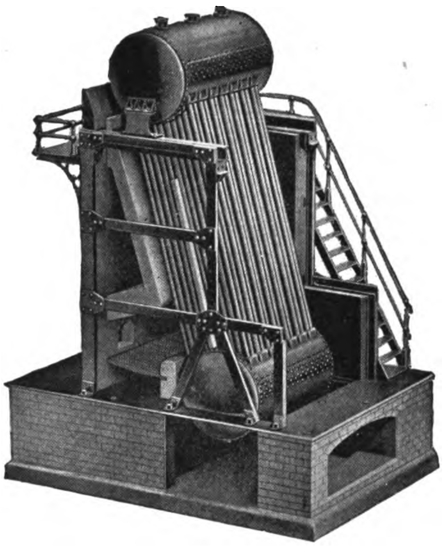
JOHN MOHR & SONS

349-359 W. Illinois St. CHICAGO, ILL.

GARBE WATER TUBE BOILER, BLAST FURNACES, STEEL LADLES, HOT STOVES, CUPOLAS, FURNACES, MIXERS, CONVERTERS, STERILIZERS, ETC.

THE GARBE BOILER

Special Advantages



Garbe Patent Water Tube Boiler

All handholes with their troublesome and expensive gaskets are eliminated, as the tubes are expanded into very large drums which are equipped with the patented pressed "Garbe" Plate. Any tube can easily and quickly be inserted, removed and replaced without disturbing any of the others.

Elimination of all flat surfaces, stay bolts and braces. All parts of Boiler are cylindrical and curved.

All tubes are absolutely straight and nearly vertical, therefore the entire circumference of tube is directly exposed to the gases. The effective heating surface is materially larger than that obtained by horizontal tubes.

The upper drum is suspended from a substantial structural frame work, absolutely independent from the mason work. The lower drum is in contact with two slides or guides, thereby allowing free expansion of tubes, equalizing the strain between drums and reducing chances of leakage to a minimum.

The vertical arrangement of tubes allows the steam to develop very freely and to flow by the shortest way possible without changing direction to the upper drum, thereby causing a very rapid circulation. The tubes are distributed over the full length of the Boiler, thus giving a large and uniform steam liberating surface, equal to the full area of the tubes. This vertical arrangement of tubes will do away with local overheating and consequent rupture of the tubes so often occurring in horizontally arranged tubes.

Soot, dust and ashes cannot accumulate on tubes or any part of drum, thereby allowing longer periods of operation without the necessity of cleaning.

Large water capacity, due to the extremely large size of upper and lower drum, insuring a more constant water level than any other Boiler.

The feed water passes through the rear bank of tubes, which have the lowest temperature, to the lower drum and deposits therein all impurities.

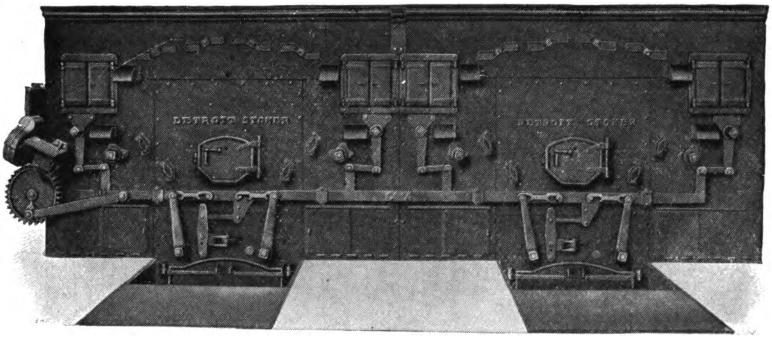
Over half of the entire heating surface is effective in liberating steam.

Practically no scale in tubes owing to rapid circulation and vertical tubes.

DETROIT STOKER COMPANY

DETROIT, MICH.

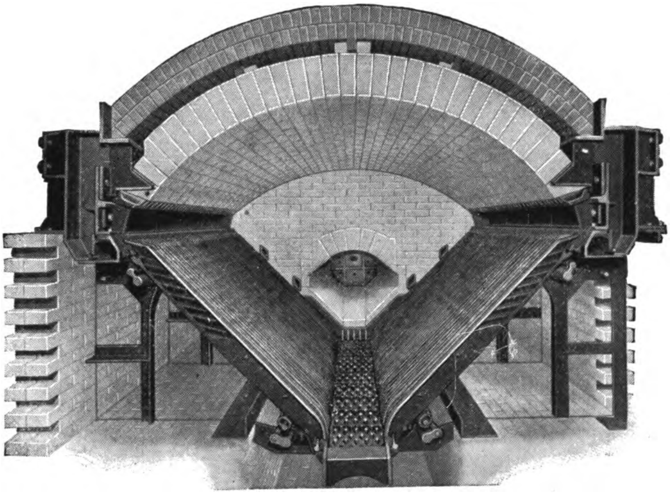
THE DETROIT STOKER



Front view of two stokers in one battery to be operated by either a fully enclosed, adjustable speed, double engine or electric motor, as preferred.

Stokers may be operated by hand when desired.

The openings through the front admit air for combustion. The even distribution of fuel on the grates insures high overload and good efficiency.



Rear view showing the double arch construction used when the stokers are installed with the extension setting. Air admitted through the front, under control, is heated between the arches and enters through openings directly over the coking coal as it is fed from the coal magazines at the upper end of the grates on both sides.

Each alternate grate is operated by links connected to the operating bar in front and have a slicing motion to keep the entire bed of fire moving towards the center of the furnace. The movement of the vibrating grates prevents the clinkers from forming on the grates.

The clinker crushers at the bottom, having a continuous motion, grind the clinkers and deposit the refuse in the ashpit below.

THE WICKES BOILER COMPANY

SAGINAW, MICHIGAN, U. S. A.

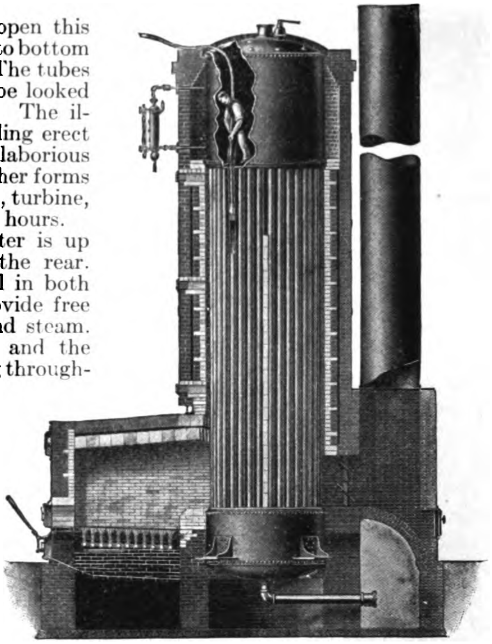
VERTICAL WATER TUBE BOILERS; HIGH GRADE RETURN TUBULAR BOILERS.

These boilers are designed for delivering dry steam, for very easy cleaning and for high every-day thermal efficiency. The illustration gives a clear idea of the design, which consists, primarily, of upper and lower drums joined by perfectly straight boiler tubes.

The steam drum is arranged to give a height of 66" from water line to the dished head, upon which the steam outlet nozzle is riveted. This high drum serves several purposes. It provides room for separation from the steam of water which is always entrained with steam at a point close to the surface of liberation; it gives room for workmen to stand inside of the boiler when cleaning the tubes, and since the shell is subject to a mild degree of heat some superheat is effected upon the steam.

Two 12" x 16" manholes open this boiler, it is accessible from top to bottom for inspection and cleaning. The tubes are straight; every tube can be looked through, washed or scraped. The illustration shows a man standing erect using a turbine cleaner. Is it laborious compared with the work in other forms of boilers? Two men can open, turbine, close and fill this boiler in ten hours.

The circulation of the water is up the front tubes and down the rear. The tube area is made equal in both sets of tubes in order to provide free circulation both for water and steam. Steam pockets cannot form and the arrangement equalizes heating throughout the boiler.



The blow-off is located at the very lowest point of the bottom of the mud drum. Feed water is usually introduced into the steam drum directly into the down-take tubes far below the water line.

The furnace is of the external oven type, the grate surface being entirely surrounded by highly heated surface in order to avoid chilling the products of combustion. Any type of stoker may be applied to the furnace.

The gases in their flow from furnace to outlet are compelled to sweep over heating surface in every foot of their travel; every foot of heating surface in the boiler is swept over by the gases in their travel. The gases are closely enough confined to the heating surface to entirely surround and cover it, as well as establish a strong scrubbing action of gas to metal. No chance for gases to short-circuit exists. No chance for gases to enter pockets in the setting unfilled with heating surface exists. A very long gas travel is provided. The design provides for the very best heat transfer by conduction and convection.

The tubes being vertical, soot and dust carried on gases and impurities precipitated from the water fall to the mud drum, where easy removal is provided for.

The boiler is constructed of the very best homogeneous steel, made by the open hearth process. The highest character of workmanship known to the art at the present day is put upon these boilers. The closest scrutiny and inspection by the best informed on this workmanship is invited and requested.

[illegible] ST[illegible]KER COMP[illegible]

THE DETROIT STOKER

Front view of two stokers in one battery to be [illegible]
adjustable speed, double engine or electric [illegible]
Stokers may be operated by hand when [illegible]
The openings through the front admi[illegible]
tion of fuel on the grates insures high over[illegible]

Rear view showing the double [illegible]
installed with the exten[illegible]
[illegible] is located between [illegible]
[illegible]
[illegible] boilers.
[illegible] alternate [illegible]
[illegible]
[illegible]
[illegible] from [illegible]
The stoker [illegible]
[illegible] and [illegible]

[illegible] ENGINEERING COMPANY

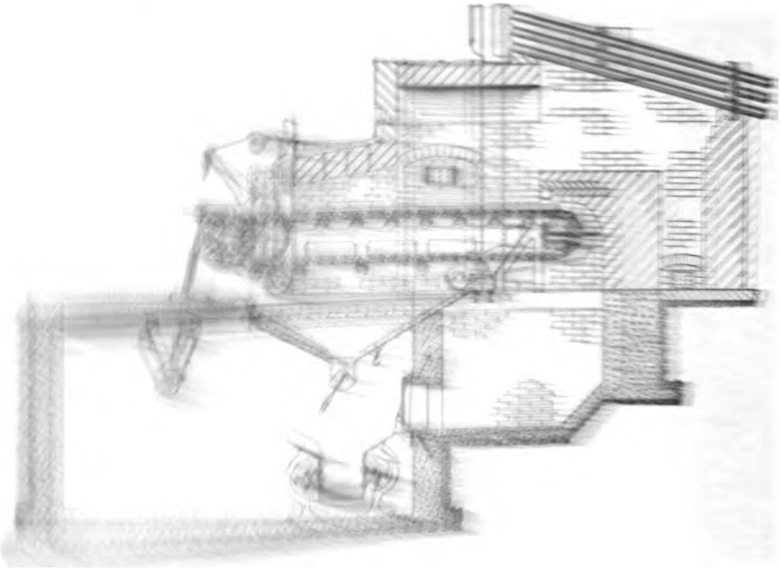
[illegible]

[illegible] GREEN CHAIN GRATE STOKERS; GECO RAT- [illegible] PRESSURE WATERBACKS; GECO PNEU- [illegible] SYSTEMS.

GREEN CHAIN GRATE STOKER

[illegible] a practical demonstra- [illegible] at the front of the [illegible] of the furnace, where [illegible] is admitted and [illegible] economically [illegible] with low grade fuel [illegible] economically [illegible] is low and the cost [illegible] minimized.

[illegible] Horizontal Water Tube Boiler



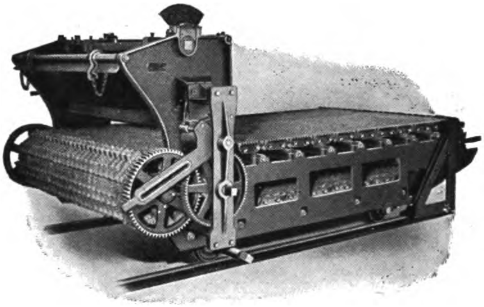
[illegible]

[illegible] adaptable to any make of boiler. The fire [illegible] girders of frame are entirely away [illegible] provide an increased air supply. Heavy [illegible] form the firing bed. These links inter- [illegible] without excessive loss of fine coal. [illegible] heavy plate on under side upon which [illegible] with the members just above and below, [illegible] portion of grate, where ashes dis- [illegible] by dampers, which prevent the [illegible] the lower part of the chain. [illegible] or below the [illegible]

GREEN ENGINEERING COMPANY

GREEN CHAIN GRATE STOKER

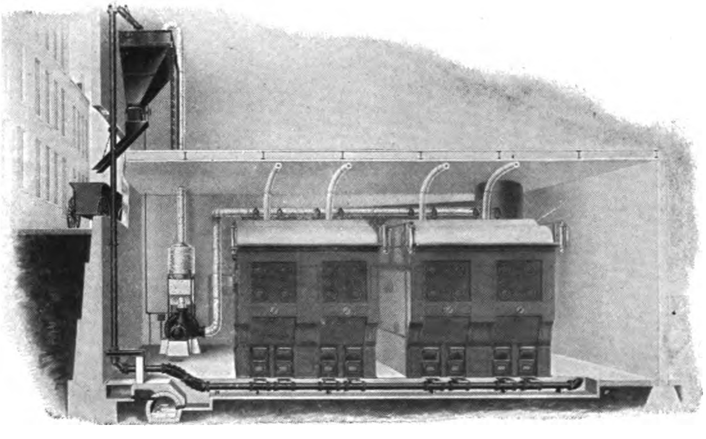
The grates are built in any width and in lengths from 9 ft. up to 12 ft. deep. Driving mechanism consists of ratchet, cast-steel pawls and cast-steel spur gear train babbitted in a special self-contained frame independent of, but bolted to the stoker front side frame. Quick adjustment may be had over a wide range and the source of power may be either above or below the boiler-room floor. A regulating feed-gate permits hard firing and is provided with an easily renewable tile lining, which prevents injury to the gate by fire eating back into coal hopper. The igniting arch is adaptable to any width furnace and easily renewable at low cost. It is flat, ventilated, and it gives uniform ignition the full width of the furnace and allows local repairs at any point without undue loss of use of the boiler.



Stoker Withdrawn from Setting

GECO PNEUMATIC ASH HANDLING SYSTEM

This system consists of a conveyor pipe located convenient to ash pits and provided with openings into which ashes are readily hoed. An air current of high velocity instantly carries the ashes to a separator and storage tank. On entering tank the ashes are automatically sprayed, thoroughly quenched, separated from air and deposited. An exhauster produces the air current. Tank may be readily emptied by gravity into carts, or cars. One man operates system.



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N ENGINEERING COMPA

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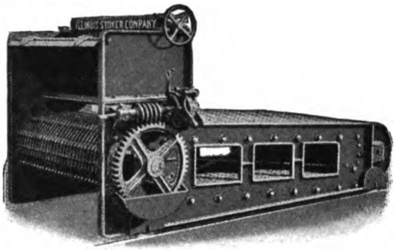
ILLINOIS STOKER COMPANY

ALTON, ILLINOIS, U. S. A.

MANUFACTURERS OF CHAIN GRATE STOKERS

THE ILLINOIS STOKER COMPANY'S GRATE STOKER



Showing driving mechanism of Stoker

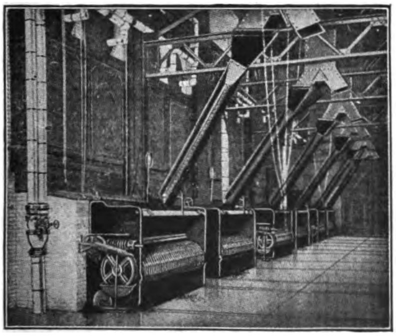
The general view of this Stoker is given in the illustration herewith. The coal is supplied to the traveling grate from the hopper, shown in the upper front part of the furnace. The grate in carrying the coal into the furnace passes under an adjustable gate which can be raised to give any desired thickness of fuel bed up to twelve inches by turning the hand wheel at the top of the Stoker. The adjustment, together with the variable speed at which it is possible to operate the grate by means of the speed adjusting lever shown on the driving mechanism, makes it possible to feed any desired number of pounds of coal per square feet of grate surface per hour into the furnace.

By controlling the thickness of the fuel bed and speed with which the coal is fed into the furnace, it is possible to obtain any desired load from the boiler with coal of either very high or very low heat value, or coal very small or coarse in size.

By raising or lowering the gate and determining the thickness of the fuel bed, which is fed into the furnace, proper allowance can be made for the burning of coal of various sizes. For example: Assuming that the draft over the fire is constant, the larger size of coal will have larger air spaces between the individual pieces of coal than a coal of smaller size, so that with a given draft more air will be forced through a coal bed six inches thick while burning the larger size of coal than will be forced through the same thickness while using coal of a smaller size. Adjustment should therefore be made in each case so as to obtain the proper amount of air through the coal for the proper burning of the particular kind of coal used.

The ease with which the gate can be lowered or raised in the Illinois Stoker makes it feasible to maintain the proper thickness of the fuel bed for each kind of coal supplied to the furnace. The exact thickness of the fuel bed is at all times indicated in inches by the gauge shown just above the handle for raising the gate.

Attention is called to the solid construction of the side frame of this Stoker, which is cast in one single piece from the front to the rear of the Stoker, so that the entire chain and driving mechanism is supported on this single solid casting. This construction is found only in the Illinois Stoker and makes it the most rigid and substantial Stoker on the market. Note the heavy ribs on all edges of the side frame.



Illinois Stokers in operation

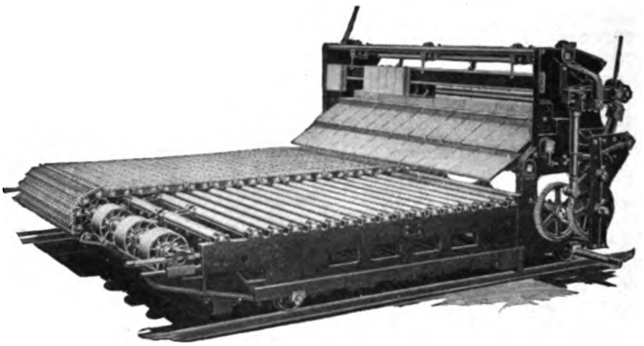
GOOD FEATURES OF ILLINOIS STOKER

Heavy Castings throughout and Rigid Bracing. Sprockets engage on Rollers, not on rods. Evenness of chain due to close spacing of rollers. Uniform distribution of air supply through coal. Patented air baffling system in rear of grate. Large combustion space due to inclined grate. Excellent speed controls. Short Link. Minimum loss of coal through grate. Independent flat ignition arch. General appearance and mechanical design. Drums are used on the rear end instead of sprocke hence there are no rear sprockets to ca trouble.

Complete illustrated catalogue mailed request.

(Continued from preceding pages)

GREEN ENGINEERING COMPANY



"L"-TYPE GREEN CHAIN GRATE STOKERS

The advantages of automatic operation of chain grate stokers have been enviously hoped for by users of low volatile coal for many years, as no other type of stoker can be operated as cheaply or with such uniformly continuous high economy and high capacity.

"L"-Type Green Chain Grate Stokers provide facilities for treating low volatile coals when introduced into the furnace to force their proper ignition and prepare them for complete combustion thereafter. The facilities provided are all automatic, simple, effective, and through wide range, making the apparatus flexible.

The burning of low volatile coal having several constituents is a complex problem of thorough ignition, and in "L"-Type Green Chain Grate Stokers, is solved by three distinct and progressive stages. The first subjects the fuel to radiated heat, liberating and igniting its volatile constituents, a process accompanied by a caking tendency, resulting from the deposit of tarry constituents onto the remaining fuel. The second stage prevents this caking by agitation of the fuel while complete coking without combustion, that is, without introduction of air, is taking place. The third stage begins with the deposit of entirely coked and ignited fuel onto the chain grate surface in a porous, fragmentary condition, permitting the passage there through of ample uniformly distributed air supply. Under these conditions, combustion is readily completed before discharge of the ash. All these processes and operations are automatically performed and can be maintained continuously after the various adjustments provided in the apparatus have been properly set for the particular fuel to be used.

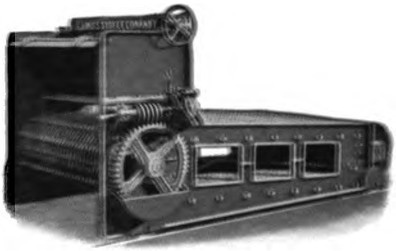
The successes made with over 50,000 H. P. in operation since the introduction of these stokers, bear out the correctness of the theory, design and practical operation of "L"-Type Green Chain Grate Stokers.

ILLINOIS STOKER COMPANY

ALTON, ILLINOIS, U. S. A.

MANUFACTURERS OF CHAIN GRATE STOKERS

THE ILLINOIS STOKER COMPANY'S GRATE STOKER



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Illustrated catalogue mailed on

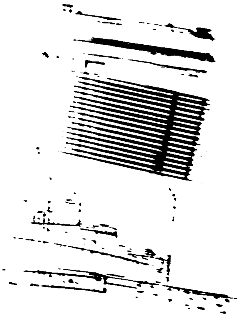
[illegible] PRODUCTS

[illegible]

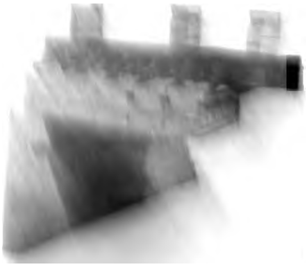
[illegible] standard size [illegible] unusually heavy [illegible] designed for the ev- [illegible] mechanically, these [illegible]

[illegible] ed by modern power [illegible] design, [illegible] ness in the selection of material and [illegible] construction can make them.

[illegible] importance to the mechanically per- [illegible] arrangement and construction [illegible] covering and surrounding brick [illegible] forms of furnace space. [illegible] maintenance cost, smokelessness, [illegible] high rate of burning are more [illegible] design and construction [illegible] which features receive our [illegible] every engineering de- [illegible] experience in the [illegible]



[illegible] Added to Water Tube Boilers



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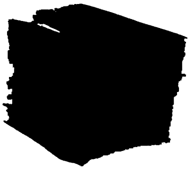


THE MODEL STOKER COMPANY

DAYTON, OHIO

THE MODEL AUTOMATIC SMOKELESS FURNACE

We manufacture exclusively the Model Automatic Smokeless Furnace. An automatic furnace for power boilers which both stokes and cleans the fire, insuring practically complete or smokeless combustion, decided economy, superior utility, durability and low cost of maintenance.

It is an advance development of the double or side feed type.

All parts are well protected against destructive heat and readily adjustable to suit requirements. Stoker engine uses only about ½ of 1% of steam made.

Any or all parts can be operated by hand. Combustion is complete in fire chamber, and there is no smoke even when heat gases pass directly from under the arch to the water surface of boiler.

The improved construction renders it the most durable and most efficient furnace in use. Requires less fuel, less labor and less cost for maintenance for any given duty. Uses successfully any soft coal of feedable size. Responds readily to any variations and will crowd a boiler quickly and strong. Adaptable to any style of boiler and to every class of duty requiring high temperatures.

Coal can be supplied by gravity or by hand and ash removed mechanically or by hand.

Improved Construction and Operation

The improvements embodied in the Model Automatic pertain to simpler and better construction, interchangeability of parts, greater durability, ready access and minimum cost for renewals, adjustability to meet varying requirements due to variations in fuel or of duty, regularity of fire, variable to suit requirements, constant automatic cleaning of fire, insuring continuous smokeless combustion, greater utility and minimum labor for attendant.

Its efficiency and general utility is admittedly unequaled by any other type or make of boiler furnace.

The only furnace which KEEPS the fire CLEANED.

[illegible] IRON WORKS

[illegible]

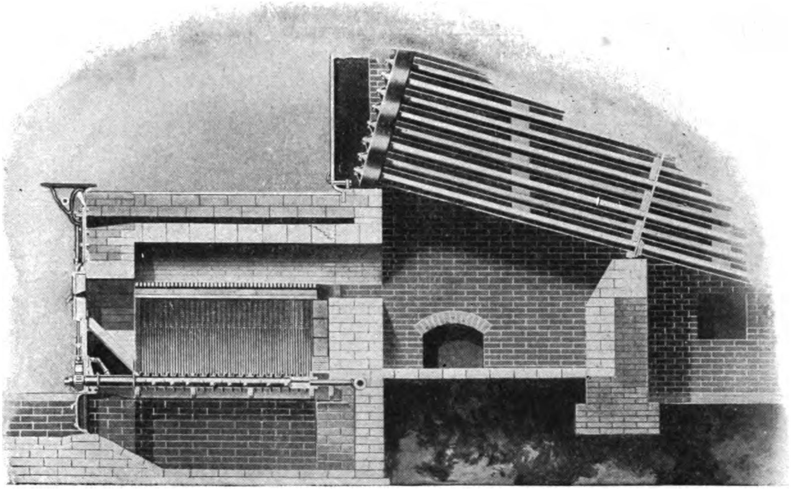
[illegible] OF THE [illegible] FURNACES.

[illegible]

[illegible] making [illegible] give excellent [illegible] requiring such as [illegible]

[illegible] making [illegible] give excellent [illegible] requiring such as [illegible] heat-

MURPHY IRON WORKS



Murphy Furnace—Dutch Oven Setting

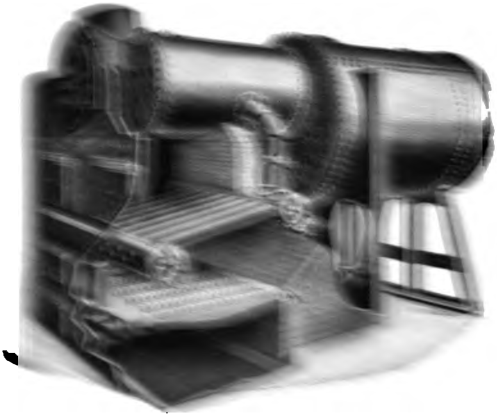
At either side of the furnace extending from front to rear is the coal magazine into which the coal may be introduced either by hand or mechanically. At the bottom of this magazine is the coking plate against which the inclined grates rest at their upper ends. The stoker boxes, operated by segment gear shafts and racks, push the coal over the coking plate and onto the grates. The grates are made in pairs, one fixed and the other movable. The stationary grates, at their lower ends, rest on the grate bearer, which also acts as a support for the clinker grinder. The clinker grinder consists of a square steel shaft, onto which is slipped small cast iron toothed segments, which are readily replaced in case of breakage. Just over the coking plate is the arch plate, from which a fire brick arch is sprung over the entire furnace. Upon this arch plate are cast numerous ribs to form a series of air ducts immediately over the coking plate, conveying the heated air from the chamber above the arch into the combustion chamber. This arch plate also forms the wall of the magazine. The furnace, or battery of furnaces, can be operated by a small automatic engine, motor or by overhead shaft and ratchet drive, as may be desired. Arrangement is made for exhaust steam connections at the lower end of the grates for the protection of this portion of the grates and clinker grinders and for the softening of the clinker. In connection with horizontal tubular boilers or water tube boilers horizontally baffled, the Murphy furnace can be installed with a flush front setting. Arrangement can be made for extended or Dutch oven settings, should this be desired.

THE HAWLEY DOWN DRAFT FURNACE CO.

EASTON, PA.

BUILDERS OF THE HAWLEY DOWN DRAFT FURNACE AND THE HAWLEY SCHWARTZ METAL MELTING FURNACE

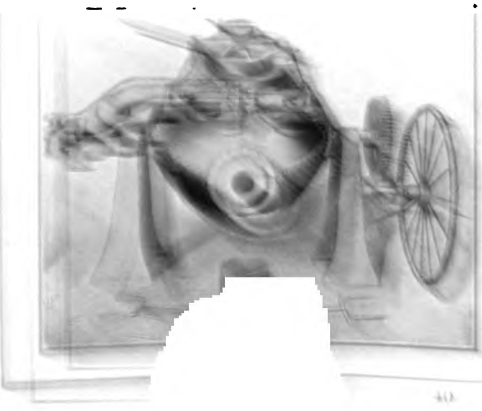
THE HAWLEY DOWN DRAFT FURNACE



The Hawley Down Draft Furnace consists of two [illegible] the [illegible] common grate. The [illegible] grate is [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible] temperature [illegible] the coal [illegible] [illegible] [illegible] really [illegible] [illegible]

[illegible] Smoke- [illegible] bituminous coal, being [illegible] output [illegible] 10 to 20 per [illegible]

THE HAWLEY SCHWARTZ METAL FURNACE



[illegible] device, [illegible] annealing, melting or reducing steel, [illegible] iron, brass, bronze, copper, aluminum, etc.

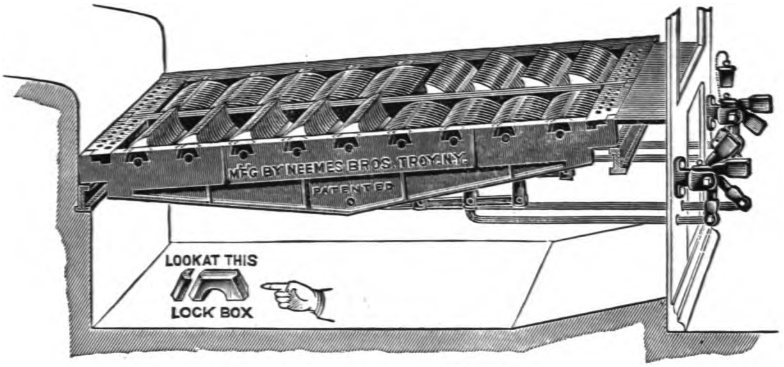
Its use [illegible] economy in space, labor, [illegible] and such savings [illegible] given it a well defined [illegible] in the metal industry. This furnace possesses advantages over crucible process [illegible] should have [illegible] catalogue which gives complete technical information. The furnace is made [illegible] following sizes: 22", [illegible] 30", 36" and 90".

NEEMES BROTHERS

24-30 River Street, ESTABLISHED 1874 **TROY, N. Y., U. S. A.**

**Babcock & Wilcox, Lmtd., Montreal, Canada. Sole makers for Canada.
The Burke Engineering Co., 525 Industrial Trust Bldg., Providence, R. I.
Sole Agents for the New England States. C. F. Catillaz, 39 Cortlandt St.,
New York City.**

MANUFACTURERS OF SQUARE AND ROUND GRATES

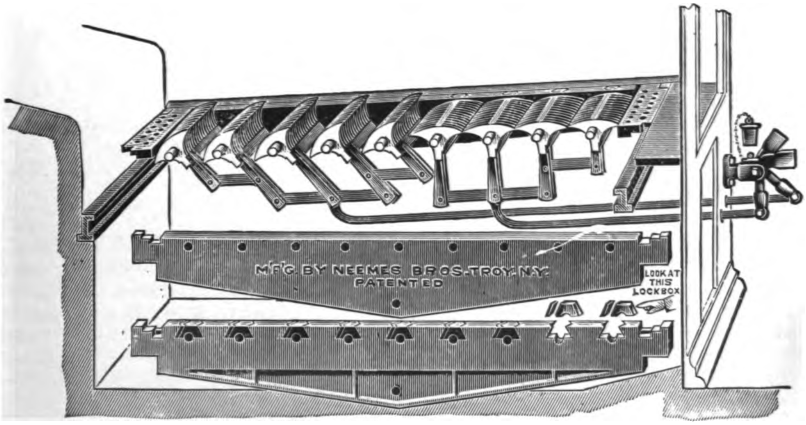


A COAL-SAVING GRATE
A grate which uses the coal wastelessly and which is so constructed that long life and continually satisfactory grate service are features.

NEEMES BROS. IMPROVED CLINKER CUTTING, SHAKING AND DUMPING GRATE

It is a triple value grate—enables you to shake out your ashes, cut out your clinkers, or dump your fire, if necessary. This grate cuts the clinker from both sides of the shaker alike. This is the kind of a grate that is wanted today, and not one that merely shakes out a little ashes. It burns all kinds and grades of fuel, and burns it all up. The construction of the grate is strong. The teeth cannot break off, as we cut and crush the clinker in the center of the concaved teeth, and not on the points of the teeth. It is easy to operate, thoroughly dependable; it accomplishes perfect results with cheaper coal and with less coal than you are now using, thus effecting a double saving, and assures perfect combustion of any grade you may use. The Lock Box is also an important feature. When the shakers are set in the frame, and the boxes put in with the locks, no shaker can possibly raise in the fire.

This grate is backed by many years' experience as grate manufacturers.



[illegible] JOHN GRATE BAR CO.

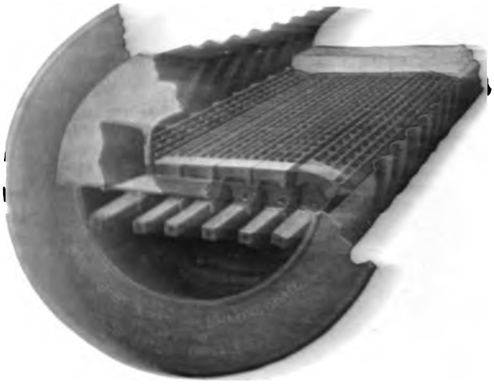
[illegible] PHILA. PA.

[illegible] MECHANICAL ENGINEERS, EXPERTS IN COMBUSTION. [illegible] WILLOUGHBY'S PATENT IMPROVED SHAKING [illegible] FURNACES. WILLOUGHBY'S PATENT ALTERNATING [illegible] FOR FIRE ENGINES AND ALL BOILERS WITH [illegible] FIRE BOXES

[illegible] ST. JOHN PATENT IMPROVED SHAKING GRATES AND FURNACES

[illegible] but are [illegible] in all kinds [illegible] furnaces, with [illegible] natural, [illegible]

[illegible] BY [illegible]



[illegible] BOILER CAPACITY

[illegible] greater [illegible] other types that [illegible] thereby evaporating [illegible] also possible to burn [illegible] grates.

[illegible] over [illegible] This is a very advan- [illegible] shaking grates.

[illegible] proof." [illegible] furnace.

[illegible] water. [illegible] longer than with [illegible] drop out, thus [illegible]

[illegible] IMPROVED SHAK- [illegible]

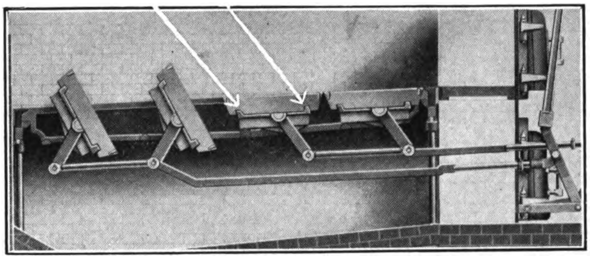
WASHBURN & GRANGER

50 CHURCH STREET, NEW YORK

THE DEAN DUMPING GRATE; DEAN SHAKING GRATE; COMBINATION SHAKING AND DUMPING GRATES OR STATIONARY GRATES.

THE DEAN DUMPING GRATE

The illustration shows a twelve-cradle grate for a furnace 10′ 4″ wide by 7′ 0″ deep. The rear grates are tipped for dumping. To clean the front half of the grate the live coals are first moved to the rear bars. Tipping cradles to angle of 65 degrees frees the grate instantly of ash and clinker. The bars are then returned to normal position and all the live coals pulled forward to permit the rear grates to be dumped and cleaned, after which the fire is spread and covered.

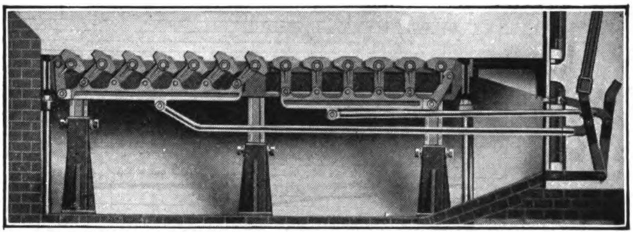


This type of grate is particularly adapted to deep furnaces and fire-boxes of water-tube boilers in which the bridge walls are built up to the tubes.

The grates rest in cradles, are free to expand and contract and are readily removable. The cradles offer a two-point bearing for the bar which prevents them from warping as occurs in bars supported only at the middle. The cradles are dumped in tandem by levers operated at the front of the boiler.

THE DEAN SHAKING GRATE

The illustration below shows a six-section shaking grate, built three sections wide for bituminous coal. This view shows adjustable legs by which the grate may be raised or lowered at the bridge wall or adjusted at any time to accommodate an increased thickness of fire. This is impossible where grates are built into the brick work. The type shown also has the advantage of freedom for expansion and contraction.



The entire grate surface moves when operated, even to the end bars. This enables the fire to be cleaned from bridge wall to dead plate solely by the movement of the grates.

COMBINATION SHAKING AND DUMPING GRATES OR STATIONARY GRATES

We manufacture grates for all sizes of furnace and in any combination for all grades and sizes of coal. Standard grate bars, boiler fronts and firing tools furnished promptly.

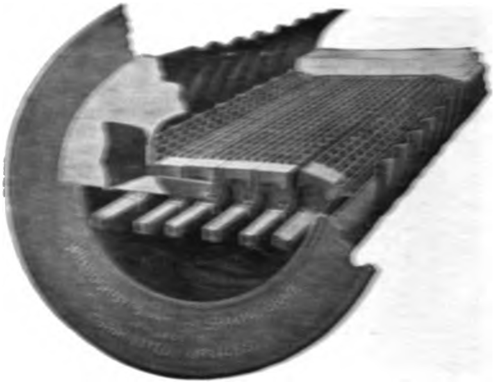
ST. JOHN GRATE BAR CO.

A. B. W[illegible], Manager

MACHINERY DEPT. THE BOURSE. PHILA. PA.

CONSULTING & MECHANICAL ENGINEERS, EXPERTS IN COMBUSTION. MANUFACTURERS OF WILLOUGHBY'S PATENT IMPROVED SHAKING GRATES AND FURNACES. WILLOUGHBY'S PATENT ALTERNATING SHAKING GRATES FOR FIRE ENGINES AND ALL BOILERS WITH CIRCULAR FIRE BOXES.

WILLOUGHBY'S ST. JOHN PATENT IMPROVED SHAKING GRATES AND FURNACES



These grates are especially suitable for internally fired Corrugated Furnaces, **but are used to advantage in all kinds of boilers and furnaces,** with any fuel, and with natural, forced or induced draft.

FIRES CLEANED BY SHAKING

Their use does away very largely with the need of "cleaning fires," since the construction and operation is such that all refuse can be broken up and passed through the bars by shaking. These grates have been run seven weeks without cleaning, using Pittsburgh coal in internally fired boilers.

INCREASED BOILER CAPACITY

The air space of these grates is so much greater than that of other types that much more coal can be burned per foot of grate surface, thereby evaporating more water and increasing the capacity of the boiler. It is also possible to burn inferior coal with good results, and less clinker than with other grates.

CONSTRUCTIONAL FEATURES

These grates run longitudinally, and present a flat surface to fire upon, over which a slice bar or hoe may be used without catching. This is a very advantageous feature not found in other shaking grates.

SUMMARY OF ADVANTAGES

The most business-like grate on the market, absolutely "*fool proof.*"
It is simple in construction. Easily operated.
It will reduce your coal bills. Adapted to any style furnace.
No cold air over the fire.
Adapted to either hard or soft coal.
Will reduce the clinker to a minimum.
Increased air space. Will improve the efficiency of your boiler.
Cleanings are reduced to a minimum, and doors kept closed longer than with any other method.
No bolts or nuts or cotter pins to become loose or broken and drop out, thus disabling grate at the most inopportune times.

GUARANTEE

With the installation of the WILLOUGHBY PATENT IMPROVED SHAKING GRATES we will guarantee the boiler to develop twenty-five per cent higher capacity than can be secured from the stationary grates under like conditions, or, we will guarantee the boiler to develop the same capacity as you now secure from the [illegible] under like conditions [illegible] Provided an evaporation test be made [illegible] in the presence of our representative.

[illegible] the most efficient combustion of [illegible] design for all fuels.

WASHBURN & GRANGER

50 CHURCH STREET, NEW YORK

THE DEAN DUMPING GRATE; DEAN SHAKING GRATE; COMBINATION SHAKING AND DUMPING GRATES OR STATIONARY GRATES.

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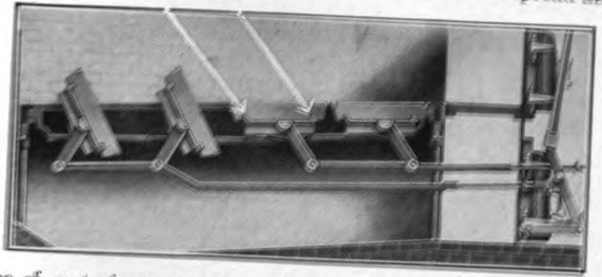

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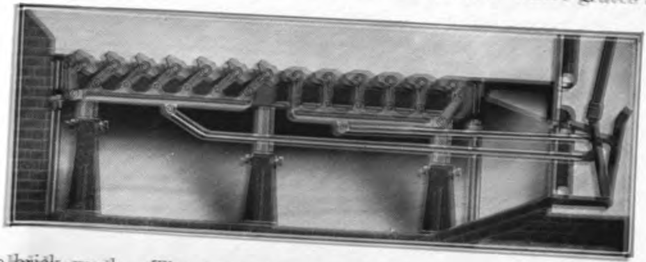


The entire grate surface moves when operated, even to the end bars. This enables the fire to be cleaned from bridge wall to dead plate solely by the movement of the grates.

COMBINATION SHAKING AND DUMPING GRATES OR STA[illegible]ARY GRATES

We manufa[illegible]s fo[illegible]f furnace [illegible]d in any combination for all grades and [illegible]e [illegible] fronts and firing tools furnished [illegible]

[illegible] ARCH COMPANY

[illegible] WIS.

[illegible] AND [illegible]

[illegible]

[illegible]

[illegible]

POWER SPECIALTY COMPANY

111 BROADWAY, NEW YORK, N. Y.

Boston Philadelphia Chicago Pittsburg Birmingham San Francisco

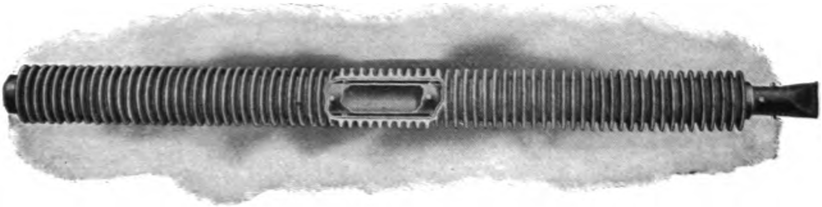
FOSTER SUPERHEATERS; DUVAL METALLIC PACKING; SUPERHEATED STEAM BRONZE GASKETS, HEENAN MUNICIPAL REFUSE DESTRUCTORS.

THE FOSTER PATENT SUPERHEATER

The Foster Superheater is made for every class of service, either combined with boilers or separately, in four general types, as follows: (1) Attached Type for superheating up to 200 deg. Fahr., (2) Separately Fired Type for any range of superheat up to 1200 deg. Fahr., (3) Waste-Heat Type for steel and fabric mills or marine practice and (4) Portable Type for heating steam or air with oil, coal or gas fires.

CONSTRUCTION

Those features of construction which distinguish the Foster Superheater from all other types are chiefly the result of actual experience in designing and building superheaters.



Sectional View of Foster Superheater Element

The Foster Superheater consists of a series of straight elements or tubes which are generally placed parallel to each other. The elements are joined at one end to manifolds or connecting headers, and at the other end to return headers, for which return bends are often substituted. The elements consist of straight seamless drawn steel tubes, on the outside of which are fitted a series of cast iron annular gills or flanges, placed close to each other and carefully shrunk on to the tube so as to be practically integral with it, at the same time exposing an external surface of cast iron, which metal is best adapted to resist the action of the hot gases. This form of construction is flexible and durable, providing a section of great ultimate strength and entire freedom from internal strains. The mass of metal in the tubes and covering acts as a reservoir for heat, which is imparted to the steam evenly, tending to secure a constant temperature of steam in spite of fluctuations in the temperature of the hot gases.

Inside of the elements there are placed other tubes of wrought iron, closed at each end, which are centrally supported by means of knobs regularly spaced throughout their length. A thin annular passage for the steam is thus formed between the inner and outer tubes. The steam clinging closely to the heating surface is quickly and efficiently heated.

The joints at the ends of the elements are made by expanding the steel tube into headers which are of wrought steel.

The resulting advantages of the above features are thus summarized: PERFECT STEAM CIRCULATION, ANY DESIRED TEMPERATURE, UNIFORM SUPERHEAT AND FREEDOM FROM REPAIRS.

DUVAL METALLIC PACKING

is extensively used for superheated and saturated steam, also for steel or iron plungers where working in water or oil, in pumps or accumulators, for heavy pressures from 500 to 2500 pounds per square inch of pressure. No special form of stuffing box is required. The packing is flexible, made of fine quality wire plaited into square forms, and is easily cut with wood chisel. It is adopted in the French, British and American Navies.

SUPERHEATED STEAM BRONZE GASKETS

give excellent satisfaction in flanged joints of pipes conveying superheated steam. They are corrugated evenly with sharp ridges. The metal is well suited to high temperatures and has elastic properties tending to maintain tight joints.

MONARCH BOILER ARCH COM

631 Wells Bldg., MILWAUKEE, WIS.

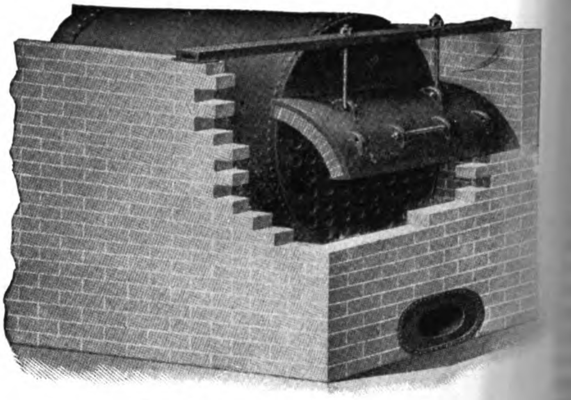
MANUFACTURERS OF REAR COMBUSTION CHAMBER DOOR ARCHES FOR RETURN TUBULAR AND INTERNAL BOILERS.

MONARCH PATENTED BOILER ARCHES

For Fire Doors and Rear Combustion Chamber Arches of Tubula nally Fired Boilers

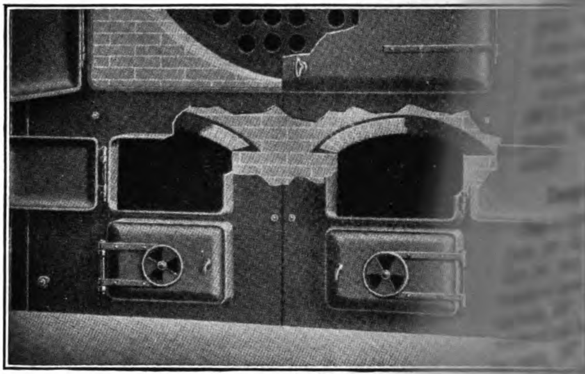
SOLVE THE BOILER SETTING PROBLEM

They are absolutely different from anything on the market, easily *guaranteed for five years.*



Rear Combustion Chamber Arch

We use only best grade of fire brick and there is no binder bet **burn out. The brick** are held in place by the metal which is shrunk and consequently they cannot fall out. There is no metal exposed and they are absolutely air tight. No more annoying delays and pairs due to faulty arches. They have been used in representative throughout the country for the past ten years.



Fire Door Arch

Full information, list of satisfied users and free booklet entitled TAL TUBULAR BOILER SETTING," sent on request.

THE GREEN FUEL ECONOMIZER CO.

twice the rate of 50 cents per year while in operation; therefore in the column for $3.00 coal find $1.00, run horizontally to the curve, which is encountered at 1 sq. ft. per 100° F. difference between hot gases and cold water. As in this example the difference is 400°, four square feet will be the right amount of Economizer surface to install per boiler horse power developed in order to secure an annual profit of 50 cents per square foot.

Construction of Economizer

Green's Economizer, as perfected by 60 years' experience, consists of vertical cast iron pipes about 9 ft. long, pressed with metal to metal joints into top and bottom boxes to form sections, which are assembled side by side to make the complete Economizer. The sections communicate through flexible joints placed outside the Economizer chamber with two branch pipes, one running lengthwise at the bottom and the other at the diagonally opposite upper corner, the water being introduced into the former and discharged from the latter. The pipes are cast of a special grade of iron in vertical dry sand molds, and are tested to 500 lbs. pressure per square inch. The top boxes are planed on the sides and fitted together to make a gas tight joint, rendering other covering unnecessary. Our patented ovoid bottom box is so constructed as to leave large passages between for convenience in replacing scrapers, and also to prevent the bridging of soot across from one box to another. When installed with Green's Sectional Covering, the Economizer is readily accessible in all parts.

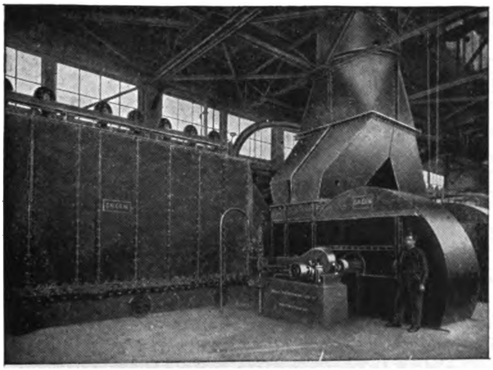
Dimensions

Height from bottom of sections to top of scraper gearing 13 ft. 5½ ins. Height over sections, 10 ft. 2½ ins. based on 9 ft. pipes; 10 ft. pipes and other lengths are special. Each section occupies 7½ ins. of the length of the Economizer.

Widths: Four pipe sections, 3 ft. 4 ins.; six pipe sections, 4 ft. 8 ins.; eight pipe sections, 6 ft.; 10 pipe sections, 7 ft. 4 ins.; twelve pipe sections, 8 ft. 8 ins. For one side damper add 9 inches, for two, add 18 inches. Diameter of pipes, 4 inches. Square feet of heating surface per pipe, 12.

GREEN'S MECHANICAL DRAFT OUTFITS

In many cases it is more economical to provide a fan and engine to produce draft than to depend upon the chimney, especially as the heat required to produce draft in a chimney can better be employed in warming feed water in an Economizer. Mechanical draft is also useful in increasing the capacity of boilers, enabling the boilers to carry temporary overloads, making possible control of fires in all conditions of wind and weather, enabling the plant to use a cheaper grade of coal, etc. Green's Induced Draft Fans are constructed of especially heavy steel plate, and the wheels are thoroughly well made, the floats or vanes being attached to the side plates by angle irons instead of by turning up the ends of the blade and riveting. The wheel is also stiffened by angle iron rings at the inner and outer edges of the side plates, also by special stiffening rings on the spokes in the case of large wheels. We have built a large number of mechanical draft wheels 18 ft. in diameter and 8 feet wide and larger.



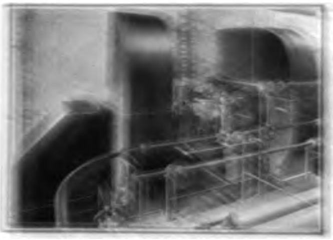
Where chimneys are already installed, Green's Forced Draft Outfits will make possible a great increase in boiler capacity without the necessity of additional or higher chimneys.

B. F. STURTEVANT COMPANY

HYDE PARK, BOSTON, MASS.

[illegible]

MECHANICAL DRAFT, FUEL ECONOMIZERS, STEAM TURBINES, STEAM ENGINES, GASOLENE ENGINES, GASOLENE ENGINE GENERATING SETS, MOTORS, GENERATORS, STEAM TRAPS, HEATING AND VENTILATING SYSTEMS, FANS, BLOWERS, EXHAUSTERS, ETC.



MECHANICAL DRAFT

Draft produced by a fan is called mechanical draft, and may be forced or induced as conditions demand. Its cost is from [illegible] to 40 per cent of that of a chimney. Its intensity permits of the burning of cheap or low grade fuel. It makes possible the utilization of the flue gases which a chimney wastes in producing draft. It is independent of the weather, decreases smoke, increases the capacity of an existing plant, and serves as an auxiliary to a chimney already overburdened. It saves space and is portable.

FUEL ECONOMIZERS

The Sturtevant Economizer effects:
A saving of 10 to 20 per cent in fuel.
An increase of 20 to 40 per cent in boiler capacity.
An appreciable extension of the life of a boiler.
A purification of the feed water.
A reduction in expense of repairs.
The deposit of large amounts of soot.

In the Sturtevant Economizer the pipes are arranged "staggered" instead of in straight rows, thereby giving the pipes a better opportunity to absorb heat from the gases. These economizers are made with tight metal-to-metal joints that require no packing, cement or rusting. The placing of the pipes of one row opposite the spaces of the adjacent sections increases the effective area of the transmitting surfaces and thoroughly breaks up the currents of hot gases by directing them between the pipes and against those standing in their paths.

STEAM TURBINES

The Sturtevant Steam Turbine is of the multi-velocity type, and its operation is such as to give high efficiency, and permit of moderate rotative speeds without gears. Hand valves are used for shutting off the nozzles, and the speed is regulated by a centrifugal throttling governor placed on the end of the shaft.

No special foundations are required and the turbine can be placed on an ordinary floor. Internal lubrication is unnecessary, therefore the exhaust steam is free from oil.

5 regular sizes from 5 to 250 H.P.
Approximate speed from 4000 to [illegible] R.P.M.

STEAM ENGINES
(Automatic High Speed)

Vertical Single Cylinder from 5 to 57 H.P.
[illegible] H.P.
[illegible] Engine from 39 to 225 H.P.

Sturtevant [illegible] adapted to continuous operation for long periods [illegible]. Gravity lubrication and complete [illegible] moving parts insure cleanliness and high mechanical [illegible]. Rites Governor gives 1½ per cent speed [illegible].

MOTORS, GENERATORS AND GENERATOR SETS

Direct Current Apparatus for any Standard Voltage

Bi-Pole Motors (closed type)	[illegible] to 3 H. P.
Four-Pole Motors	[illegible] to [illegible] H. P.
Eight-Pole Motors	[illegible] to [illegible] H. P.
Six-Pole Generators	[illegible] to [illegible] K. W.
Eight-Pole Generators	[illegible] to [illegible] K. W.
Turbine Generators	[illegible] to [illegible] K. W.
Steam-Engine Generator Sets	[illegible] to [illegible] K. W.

B. F. STURTEVANT COMPANY

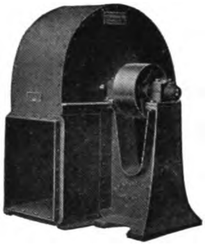
STEAM TRAPS

This steam trap, made for different pressures, is designed for steam heaters or radiators of any construction. Both extension and cone are of brass ground to a fit. The pot is readily removed for cleaning by loosening up the bolts.

PROPELLER FANS

Propeller fans are designed for use against low pressures, and are applicable for ventilation and exhauster work in boiler and engine rooms, kitchens, clubrooms, smoking rooms, offices, stores and similar places. They are constructed with a frame of cast iron, that is fastened into the wall of the building and are driven by either belt or direct-connected electric motors that are enclosed and dust-proof. The construction of these propeller fans is exceptionally strong and durable. Propeller fans are made in sizes of from 18 to 120 inches in diameter.

MULTIVANE FANS



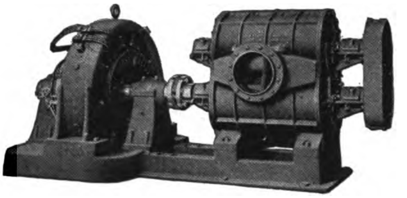
Multivane blowers and exhausters driven by direct-connected Sturtevant motors, turbines, and engines form the most satisfactory and efficient fan sets on the market. The blast wheel or runner for this fan is composed of shallow floats, which permit the use of very large inlets while maintaining the necessary blade area. The large inlet allows the air to enter with the least loss in friction. Each blade or float is spooned to distribute equally the pressure within the casing and to add rigidity and strength to the wheel.

STEEL PLATE FANS

Sturtevant steel plate fans are designed for all sorts of blower and exhauster work. They are the result of fifty years' experience in blower design, are especially strong and durable and are suitable for direct-connected steam engine and electric motor drive and for belt drive. Steel plate fans are built for ventilation and mechanical draft installations, and for planing mill and other exhauster work.

BLOWERS AND EXHAUSTERS

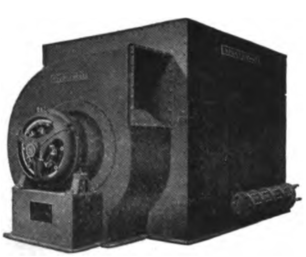
The Sturtevant High Pressure Blower is made in two types; in the smaller sizes the idler is directly above the impeller, and the shafts lie in a vertical plane. In the larger sizes, the shafts are in a horizontal plane, the intake and discharge being at the bottom and top.



High Pressure Blowers are designed to deliver air at pressures up to five pounds. They are especially adapted to furnishing blast for cupolas, gas and oil burners, annealing and smelting furnaces, cement kilns, and for all sorts of blower or exhauster work demanding high pressures. Special stuffing-boxes to prevent leakage are furnished when these blowers are used to handle gases.

The B. F. Sturtevant Company makes complete installations, including direct-connected, belted, or geared engine or motor, exhauster, automatic regulator, blast gates, by-pass connections, and valves.

STURTEVANT HEATERS



The Sturtevant fan system of heating and ventilating is economical and positive, heated air providing ventilation as well as heat. Indirect hot blast coils are built of one inch extra heavy steel pipe screwed into cast iron sectional heater bases. Entire heater is enclosed in steel plate casing. Heater is applicable to use of either live or exhaust steam or hot water. System can be used for heating and ventilating any sort of building. The operation is independent of the weather or of atmospheric conditions. By the use of the Sturtevant air washer, the air may be washed at all times, and cooled in summer. Hot air from the heater is forced by a fan through ducts into the building to be heated, and is allowed to escape through vent flues. Fans are driven by steam engine, motor or belt. The steam engine exhaust is used in the heater, thus eliminating the expense of running the engine. Temperature of air entering each room may be closely regulated by thermostatic control.

AMERICAN BLOWER COMPANY

DETROIT, MICH.

MANUFACTURERS OF HEATING, VENTILATING, DRYING, MECHANICAL DRAFT AND BLAST EQUIPMENT; VERTICAL SELF-OILING STEAM ENGINES, STEAM TRAPS; FANS AND BLOWERS FOR ALL PURPOSES.

Right Hand, Top Horizontal Discharge, Pulley Driven Sirocco Fan.

"SIROCCO" FANS AND BLOWERS

"Sirocco" Fan Wheel or Runner.

The reason why "Sirocco" Fans and Blowers are used in the world's largest Industrial, Educational, Office and Public Buildings, — A "Sirocco" Fan will deliver more air, consuming less power than an ordinary steel plate fan twice the size.

"Sirocco" Fans are built in sizes with capacities from 75 CFM to 1,000,000 CFM.

"Sirocco" Fans cost less to install on account of their *small size*, less to operate because of their high *mechanical efficiency*, less to maintain because of their *sound construction* and *perfect balance*.

Complete information—capacity tables, etc., in Bulletin No. 340.

"ABC" TYPE "E" EXHAUST FANS FOR EXHAUSTING AND CONVEYING SYSTEMS

Type "E" Right Hand, Top Vertical Discharge, Pulley Driven Fan, built also for motor drive.

Every wheel is perfectly balanced before mounting.

The entire construction of "ABC" Exhaust Fans provide for strength and rigidity. The bearings are self-aligning, long and of large diameter, giving ample bearing surface.

Type "E" Fans are interchangeable, can be arranged to deliver air at almost any angle by merely removing bolts from ring plates.

Regular type "E" wheels are used in Fans for removing dust from emery wheels, sawdust, etc. Long shavings wheels are used in Fans for work in Cooperage and Excelsior factories, wood pulp mills or other plants where the shavings are long and stringy, lint from buffing and polishing wheels, etc.

Bulletin No. 323 gives capacity tables, etc.

"SIROCCO" MECHANICAL DRAFT FOR STEAM BOILERS

"Sirocco" Turbine D Draft Fans, supplying forced dra sepower boilers, the largest in th

A boiler plant will do more work with "mine run" coal and a "Sirocco" mechanical draft fan than it will with *high* grade coal without "Sirocco," *because* of the increased and improved combustion, more thorough utilization of waste gases, absolute independence of atmospheric conditions and practically absolute control of the fires.

A "Sirocco" mechanical draft plant, either of the Forced or Induced Type requires small space for its installation, as compared to its capacity. Two of the largest boilers in the world are equipped with "Sirocco" mechanical draft fans.

Catalogue No. 343 is a complete treatise on mechanical draft.

AMERICAN BLOWER COMPANY

Branch Offices in New York, Chicago, Philadelphia, Pittsburg, Rochester, Atlanta, Minneapolis, San Francisco, Los Angeles, Seattle and Portland, Ore., with works at Troy, N. Y. and Canadian Sirocco Company, Limited, Windsor, Ontario.

"ABC" VERTICAL ENCLOSED SELF-OILING STEAM ENGINES

"ABC" Engines are built in two general types—Type "A," Single Cylinder and Type "E," Double Cylinder, with capacities up to and including 120 horse power, are used extensively to drive electric generators, exciter units, centrifugal and all kinds of power pumps, paper mill machines, centrifugal dryers, in fact for any purpose requiring a good dependable engine; unexcelled for any auxiliary work within their capacity.

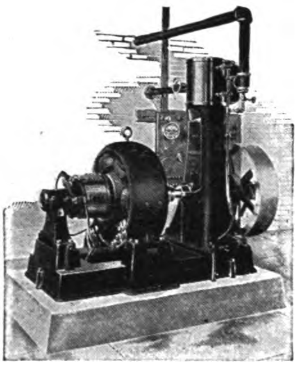
"ABC" engines will run from three months to two years without having to add new oil to original supply or make an adjustment.

Are entirely enclosed, but a turn of a nurled knob will remove side plates, rendering every piece of mechanism accessible.

"ABC" Engines are oiled automatically—by themselves, no oil leaks out of the frame; it is not a splash system, every drop goes to its proper place by gravity, and is supplied as required. *Every frictional surface runs on a film of oil, no contact between metals.*

Oil is filtered and cooled before being pumped up for recirculation.

Engine Bulletin No. 334 contains specifications, description, etc.



"ABC" Engine direct-connected to dynamo for generating electric current.

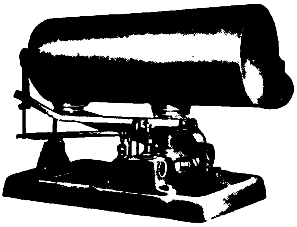
"DETROIT" AUTOMATIC STEAM TRAPS—RETURN, SEPARATING AND VACUUM

Return Traps save the most valuable part of condensation—*its heat*—by draining steam lines of the condensation and automatically returning it to the boiler *hot*.

Separating Traps are adapted to draining oil and steam separators, bleeding high and low-pressure cylinders in compound engine installations, etc.

Vacuum Traps are most successfully used to remove condensation from apparatus, or systems working under a vacuum.

Trap Catalogue No. 352 gives complete information about "Detroit" Traps.



"Detroit" Automatic Return Trap.

HEATING, VENTILATING AND COOLING WITH A "SIROCCO" FAN SYSTEM

Requires only a small space for its intallation to handle immense volumes of air, because of the small size of the fan.

"Sirocco" Fans can be installed in confined spaces which would absolutely preclude the use of any other type.

The sound construction and perfect balance of "Sirocco" Fans keep the cost of maintainence down to a minimum.

The power conserving features of "Sirocco" Fans is derived from their unique design, having a large and practically unobstructed inlet, employing blades which are short radially and very long axially.

The "Sirocco" Fan System of Heating, Ventilating and Cooling makes neat, compact and efficient equipment.

"Sirocco" Fan System of Heating, Ventilating Cooling, installed conveniently in a very low ce basement. No excavation for head room necess

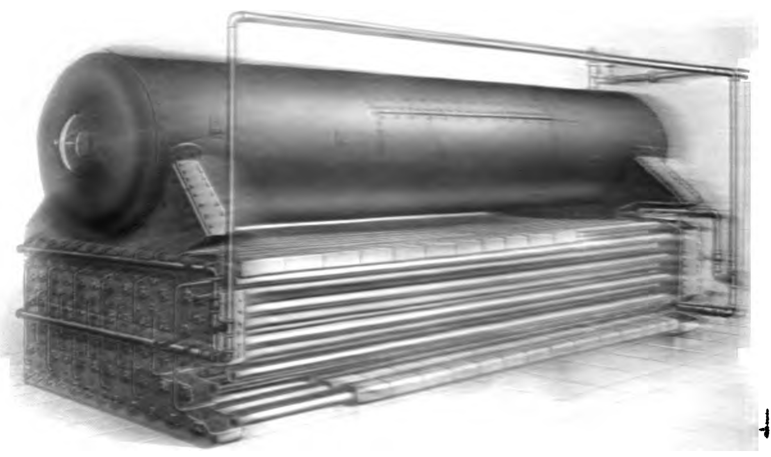
BAYER STEAM SOOT BLOWER CO.

[illegible] LASALLE STREET, ST. LOUIS, [illegible]

[illegible] St. [illegible] Fisher Bldg.
CHICAGO

MANUFACTURERS AND PATENTEES OF THE BAYER SOOT BLOWER SYSTEM FOR ALL STANDARD BOILERS.

THE BAYER SOOT BLOWER SYSTEM



Type "H" is installed on the Heine Type Water Tube Boiler

[illegible] For almost three years the Heine Safety Boiler Company has [illegible] Patented Soot Blower System [illegible] Type "H" [illegible] with each and every [illegible] other soot blower system on the market [illegible] which we believe is proof that the Bayer System [illegible] efficient soot blower in existence, the Bayer being the [illegible] soot blower ever placed on the market.

For Horizontally Baffled Boilers

The above illustration clearly shows the Bayer Soot Blower System which [illegible] installed on the Heine Type Water Tube Boiler. By [illegible] system it will be readily seen that it can be installed [illegible] single brick in your boiler setting or altering any- [illegible] the jets or nozzles enter the hollow [illegible] the water leg flush with the inside sheet. [illegible] Also note the special reducing [illegible] the hollow stay-bolts around the [illegible] removed in a few minutes, if necessary, [illegible] ordinary union.

[illegible] thoroughly blow all the soot from your boiler [illegible] away with that often shirked and disagreeable [illegible] to turn the baffle tile in order to clean the [illegible] necessarily saves the breakage of tile which [illegible] for cleaning purposes.

[illegible] fully illustrating the Bayer "Patented" Soot Blower [illegible] types of boilers, and will be glad to send same [illegible]

Our years of experience are at your service.

BAYER STEAM SOOT BLOWER CO.

For Vertically Baffled Boilers

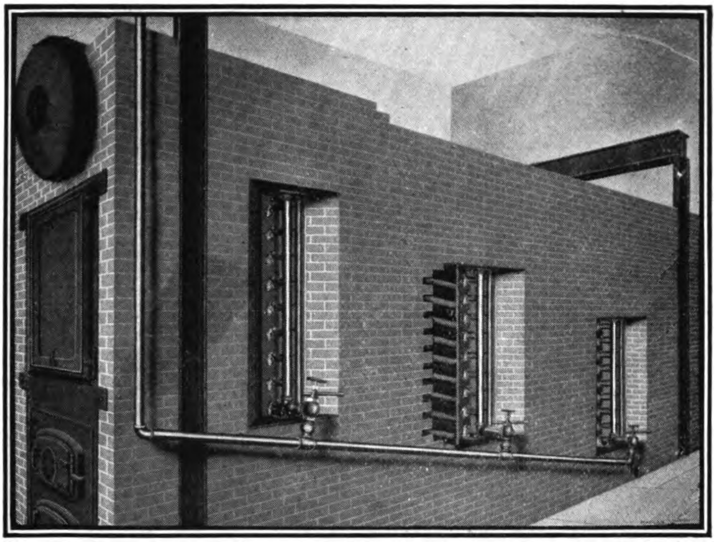


Fig. 1—Type "B" as installed on B & W Type Water Tube Boilers

In bringing our B & W Type Soot Blower to its present stage of perfection, we realized the importance of producing a device that could be installed without making any alterations in the boiler-settings, and this we have accomplished so perfectly that not a single brick need be disturbed nor any alterations made, as is plainly shown in the accompanying illustration.

Fig. three (3) is a perspective view of a single unit of the System as installed in one of the cleaning openings, and shows the simplicity and ease with which the apparatus can be attached to any vertically baffled boiler having side cleaning openings. The units of the Bayer System are secured to the plates at the top and bottom of the openings in the walls by substantial set screws (see Fig. 3), permitting the Blower to be quickly, accurately and securely adjusted to its proper position even while boilers are in service. The nozzles which always blow parallel between spaces of the water tubes are three-way cast iron nozzles. These nozzles extend through the cleaning openings flush with the inside of the boiler wall, thereby preventing them from being exposed to the direct path of the products of combustion.

To operate the Blower, move the handle of the rock shaft forward and backward slowly; this operation causes the nozzles to blow perfectly parallel with the spaces between the water tubes and reach all of the soot surface in each gas-pass or compartment. Any Blower which does not project the steam jets parallel with the spaces between the tubes with a sweeping movement cannot give perfect service.

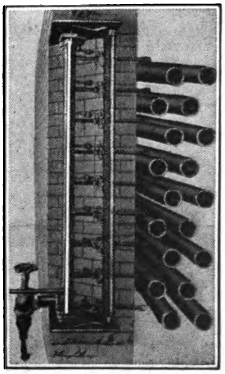


Fig. 2

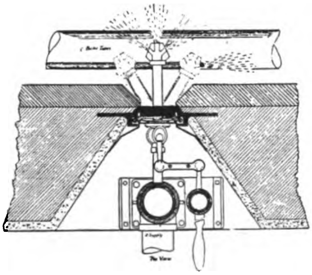


Fig. 4
Top View Showing Sweep
of Nozzles

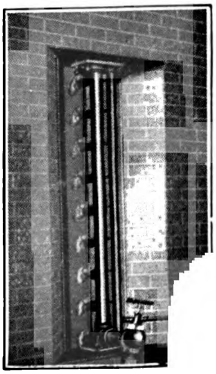


Fig 3

BAYER STEAM SOOT BLOWER CO.

2828–2842 LaSalle Street, ST. LOUIS, MO.

Branches

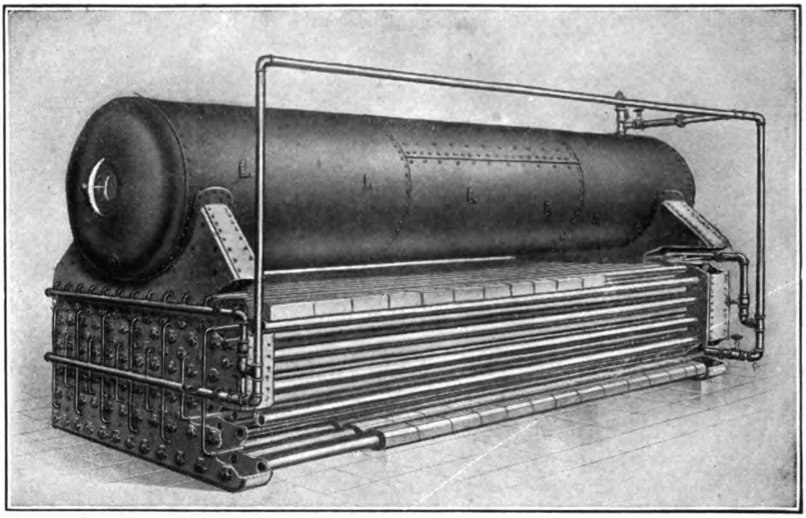
1524 Chestnut St.
Philadelphia

110 W. Thirty-Fourth St.
New York

1201 Fisher Bldg.
Chicago

MANUFACTURERS AND PATENTEES OF THE BAYER SOOT BLOWER SYSTEM FOR ALL STANDARD BOILERS.

THE BAYER SOOT BLOWER SYSTEM



Type "H" as installed on the Heine Type Water Tube Boiler

Special Note:—For almost three years the Heine Safety Boiler Company has been furnishing the Bayer Patented Soot Blower System (Type "H") for horizontally baffled boilers with hollow stayed water legs, with each and every boiler manufactured by them. No other soot blower system on the market receives such an endorsement, which we believe is proof that the Bayer System is the only practical and efficient soot blower in existence, the "Bayer" being the original and first perfect soot blower ever placed on the market.

For Horizontally Baffled Boilers

The above illustration clearly shows the Bayer Soot Blower System (which blows from both ends), as installed on the Heine Type Water Tube Boiler. By studying the application of the system, it will be readily seen that it can be installed without disturbing a single brick in your boiler setting or altering anything whatever about the boiler. Note how the jets or nozzles enter the hollow stay-bolts, projecting clear through the water leg flush with the inside sheet, thereby being absolutely protected from the heat. Also note the special reducing fitting which prevents the cold air from entering the hollow stay-bolts around the nozzles. Each header or section of nozzles can be removed in a few minutes, if necessary, by simply disconnecting an ordinary union.

With the Bayer System you can thoroughly blow all the soot from your boiler in about three minutes. It also does away with that often shirked and disagreeable job of going inside the boilers to turn the baffle tile in order to clean the boilers of soot accumulations. This necessarily saves the breakage of tile which takes place when they are removed for cleaning purposes.

We issue individual literature fully illustrating the Bayer "Patented" Soot Blower System for all standard types of boilers, and will be glad to send same on request.

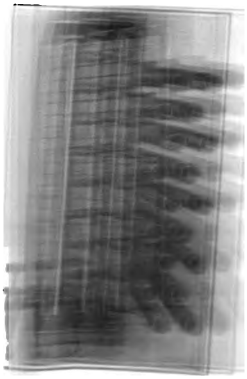
Put your soot troubles up to us. Our years of experience are at your service.

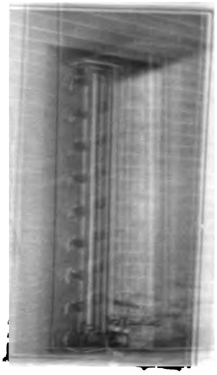
[illegible]

[illegible]

[illegible]

[illegible]





[illegible]

[illegible] STANDARD BOILERS

[illegible] WING SYSTEMS

[illegible] Design For Return Tubular Boilers

[illegible]

Front-End Design For Return Tubular Boilers

OVERCOMING SOOT

[illegible] method of overcoming [illegible] an important [illegible]

[illegible] TUBE BOILERS

[illegible]

DIAMOND POWER SPECIALTY CO.

Bourse Bldg.
PHILADELPHIA

1533 Monadnock Block
CHICAGO

Suite 24, 19 Pearl St.
BOSTON

SOOT BLOWERS FOR ALL STANDARD BOILERS

CLEANING WATER TUBE BOILERS

Soot is cleaned from the almost inaccessible points in many designs of water tube boilers—by special "Diamond" Blowers. These are now being used in a wide range of plants on such types of boilers as the following: "Hollow Stay Bolt," "Wickes" (see Fig. 4), "Stirling" (see Fig. 5), and Babcock & Wilcox (See Fig. 6).

For Return Tubular Boilers

Model A—Standard Type of Telescopic Blower with Five Holes for Stationary Boilers.
Model B—Standard Type of Telescopic Jet Blower with Dial and Pointer, One Hole.
Model C—Swinging Arm Rear-End Blower for Stationary Boilers.
Model E—Front-End Blower for Stationary Boilers.
Model F—Front End Single Arm for Stationary Boilers.

For Vertical Fire Tube Boilers. Manning Type Only

Model A—Standard Telescopic Five Hole Blower.
Model B—Swinging Arm Blower.

For Water Tube Boilers

Model C—for Wickes Boilers (Vertical Type)
Model D—For Heine Boilers.
Model H—Operated through cleaning doors. For B. & W. and all allied Types of Horizontal Boilers.
Model G—For B. & W., Stirling and all allied Types of Water Tube Boilers.

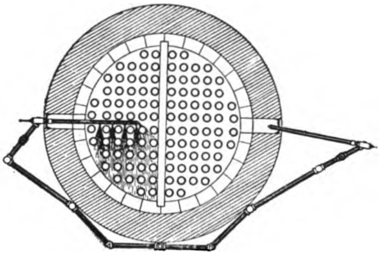
For Marine Boilers

Model A—Standard Telescopic Five Hole Blower.
Model B—Telescopic Jet Blower with Dial and Pointer.
Model C—Telescopic Jet Blower with Gear Wheel and Pinion Handle.
Model E—Front-End Blower with Cross Spider Arms.

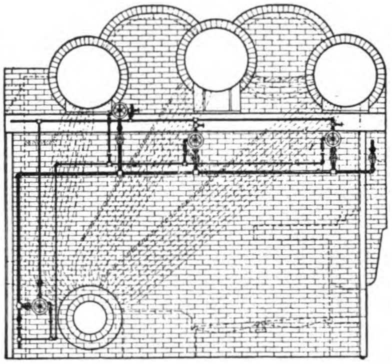
OUR ENGINEERING SERVICE

From complete files of plans and specifications covering hundreds of makes of boilers, our Engineering Department is able to co-operate with you promptly in considering the proper Soot-Blowing System for any particular installation. You should take advantage of this.

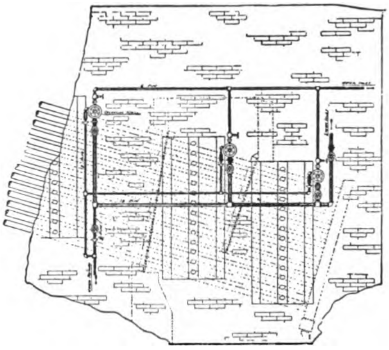
Send for detailed literature.



4. Cross-section showing application to "Wickes" Boilers



5. As applied to "Stirling" Boilers



6. For B. & W. Type Horizontal Water Tube Boilers.

THE KENNICOTT COMPANY

[illegible] HEIGHTS, ILL.

[illegible] Office
[illegible] Building

Eastern Office
[illegible] Church Street,
New York, N. Y.

[illegible] SOFTENERS AND FILTERS FOR THE TREATMENT OF WATER [illegible] PURPOSES, FOR RAILROADS AND INDUSTRIAL [illegible] LAUNDRIES, TANNERIES, DYE WORKS, [illegible] WHERE A SOFT, CLEAR WATER IS OF ADVANTAGE. [illegible] STEEL TANKS, TANK CARS, STEEL UNDER- [illegible] GENERAL STEEL PLATE CONSTRUCTION.

[illegible] OF OUR TYPE "K" WATER SOFTENER

[illegible] efficiency.

[illegible] cost.

[illegible] the average [illegible]

[illegible] the softener [illegible] the proper mixing of the chemical reagents and [illegible] softener.

[illegible] KENNICOTT [illegible] CHEM- [illegible] They [illegible]

[illegible] operation, where it is necessary to [illegible] mixing and [illegible] can be [illegible]

[illegible] seen in operation, and have been in [illegible]

[illegible] filters of our special [illegible] design.

[illegible] by means of our patented revolving [illegible] manner similar to a [illegible]

[illegible] from 50 gallons of water [illegible] KENNICOTT [illegible] installed [illegible] experience has been directed towards [illegible] results and WE [illegible]

THE KENNICOTT-JEWELL FILTER

Kennicott-Jewell Filter

If [illegible] water, the KENNICOTT-JEWELL [illegible] will solve your problem. The result of [illegible] experience [illegible] Equipped with [illegible] system [illegible] desired. The [illegible] by our Pressure [illegible] of some of the largest power [illegible] manufacturing industries [illegible]

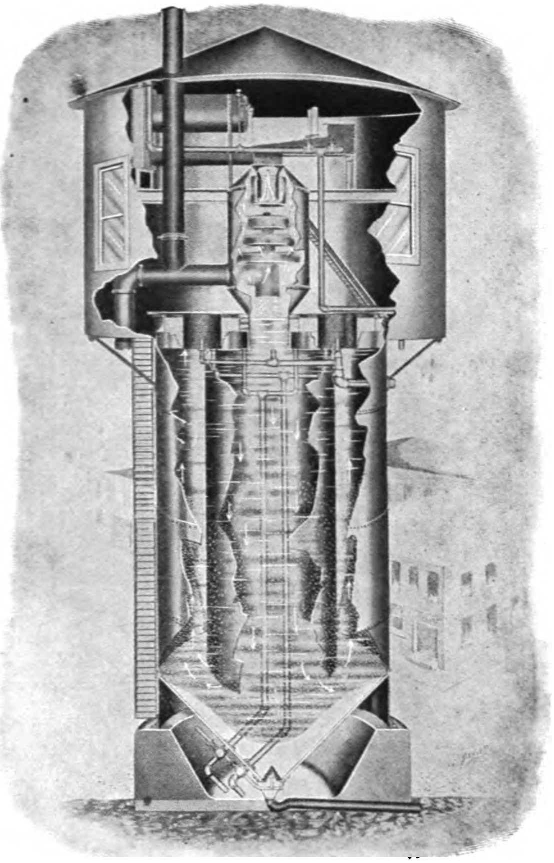
We [illegible] TYPE "K" SOFTENER [illegible] KENNICOTT-JEWELL FILTER [illegible]

WRITE FOR IT.

FETTA WATER SOFTENER CO.

RICHMOND, INDIANA

THE FETTA SYSTEM OF WATER SOFTENING
FOR POWER PLANTS, LAUNDRIES AND DOMESTIC USE



The Fetta Economizer System

The illustration will give a general idea of our large power plant water purifying apparatus as built for capacities from five thousand gallons up. The equipment, however, is subject to slight modifications to meet special conditions at each individual plant.

This is our hot process system, and the entire equipment consists of foundation, tanks, interior equipment, economizer, automatic chemical feed and control, housing over top and steel stairway.

There is a means of utilizing waste steam in the softening process; a means of distributing this steam into the water economically and a means of feeding either the crude material or stick chemical prepared by us. The location of filters and pipe work should also be noted.

By this arrangement we produce soft water with the least possible amount of chemicals and deliver the water at temperatures as high as 180° F. This means *economy in size of plant, amount of chemical, and fuel consumed.*

The supply of cold water is intermittent, thus making possible a proper settling of precipitated impurities, but the delivery of soft water is continuous. This system therefore combines the advantages of the "Intermittent" and "Continuous" systems.

It is an established fact that scale forming salts in hard water are more rea acted upon by chemicals, and thrown down, when the water is at a high temp ture, than when treated cold. This means that the action is more rapid complete, and that the treating can be made much smaller than would other be possible, at the same time giving better results. All of these advantages secured in the Fetta System.

Complete information regarding the Fetta System of Water Purification, a Bulletins describing special features mailed on request.

LOOMIS-MANNING
FILTER DISTRIBUTING COMPANY

PHILADELPHIA, PA.

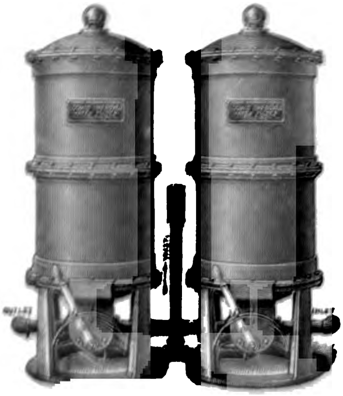
Branch Offices:
New York, Chicago, Boston, Buffalo, Baltimore, Washington

Loomis-Manning Filters are designed with three essential features in view:

Efficiency: This, in a filter, means the ability to thoroughly cleanse the filter bed each time it is washed. For unless the filter bed is kept broken up, free from lumps of all kinds which form around the gelatinous mass which has been collected by the filter bed, the effectiveness of the filter will become less and less until it is nothing. By the reverse flow of the water, the filter bed of a Loomis-Manning Filter is caused to pass up and down through the Loomis Cutting Plate which breaks up the mass of accumulated impurities so that they are purged from the bed and carried off into the waste. The entire bed is in motion, becoming cleansed, at each washing. No part of it is so heavy that it lies stagnant. The bed is a uniform grade of material from top to bottom.

Simplicity: The Manning Single Controlling Valve takes the place of five gate valves and also prevents all chance of errors. By moving one lever to four stations, plainly marked on a dial, the action of the filter may be either filtering, washing the filter bed, filtering to waste (sometimes called re-washing) or the filter may be by-passed. A sight glass is provided so that it is possible to see the quality of the filtered water and watch the cleansing of the filter bed, preventing an extravagant use of water for washing.

Durability: The cylinders and heads are close grained cast iron, to obtain the maximum durability. All materials coming into contact with water are selected to resist corrosive action. Bronze controlling valve, tinned copper screen plates, brass studs, galvanized iron or brass pipe and fittings, etc., reduce repairs to a minimum.



Essential Details: The filter bed rests on tinned copper screen plates, extending under its entire area, bringing about a uniform collection of the filtered water and a uniform distribution of the washing water, insuring a thorough cleansing. The Loomis Confining Plate extends across the filtering chamber near the top and prevents all fish, sticks, stones, etc., from entering and becoming a permanent part of the filter bed. These screen plates are sand tight, preventing any loss of the filtering material into pipe lines, pumps, etc. Baffles are provided in the top and bottom heads to distribute the water as it enters for filtration or for washing. Ample space is provided to enable the bed to wash properly. The coagulant, if necessary, is fed by our indirect method, accurately controlled.

Send for List of Installations.

H. BLOOMSBURG & CO.

425 N. CAREY ST., BALTIMORE, MD.

CIRCULATORS; STEAM JETS FOR STEAM BOILERS

THE EQUILIBRIUM CIRCULATOR AND STEAM HEATING ATTACHMENT

For Heating and Circulating the Water in Steam Boilers

Equalizes the temperature of all parts of the boiler, thus preventing the unequal expansion and contraction, with consequent leaks of seams and rivets, due to such straining.

Increases Steaming Capacity 5 to 15 per cent. on same fuel consumption or the same power on a corresponding reduction in fuel.

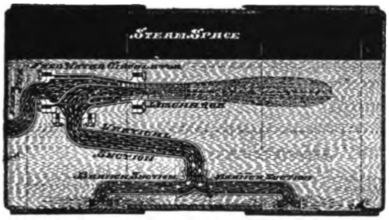
Saves cost of repairs and prolongs life of boiler.

Prevents the deposit of mud and sediment, and the formation of scale. Prevents or reduces foaming (or priming) and pitting.

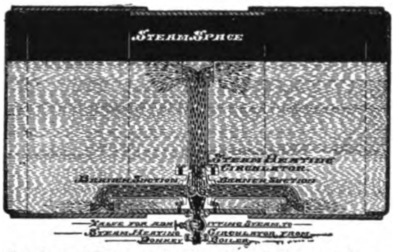
By using steam from another boiler, while starting fires, steam may be raised from cold water in an hour, without straining boiler.

We guarantee satisfactory results when properly installed

ACTION OF APPARATUS



Section of Feed Water Circulator and Pipes on Larger Scale than Boiler



Steam Space
Steam Heating Circulator.
Branch Suction
Branch Suction
Valve for admitting steam to Steam Heating Circulator from Donkey Boiler

Section of Steam Heating Circulator and Pipes on Larger Scale than Boiler

The action of the apparatus is as follows: FEED WATER on being admitted to the boiler discharges through FEED WATER CIRCULATOR and DISCHARGE NOZZLE as shown by arrows, this causes an induced current of water to flow up the VERTICAL SUCTION pipe and out through DISCHARGE nozzle mixing with the feed water as it discharges into boiler. WATER FROM BOTTOM OF BOILER now enters inlet tees and passing through BRANCH SUCTION PIPES enters the VERTICAL SUCTION PIPE, to supply the current flowing up it as shown by arrows. This action removes all the colder water from bottom of boiler and discharges it at the surface after it has become heated in its passage through the VERTICAL SUCTION PIPES by the hot water surrounding, then mixing with feed water raises its temperature before it is discharged into boiler. As the cold water is carried to the surface the hot water settles down to replace it, thus creating a rapid movement of the water in all parts of the boiler.

The operation of this apparatus is as follows: when getting up steam from cold water: While starting fires, steam is admitted to STEAM HEATING CIRCULATOR from Donkey boiler (or another boiler). This steam discharges through STEAM HEATING CIRCULATOR, as shown by arrows, up the vertical discharge pipe, heating the water in this pipe to a high temperature and causing an induced current to flow upward and discharge through the distributing tee at the surface. Cold water then enters from bottom of boiler through the inlet tees and passing through BRANCH SUCTION PIPES and STEAM HEATING CIRCULATOR, passes up the vertical discharge pipe, is heated in contact with the steam and discharges at surface as shown by arrows. This action continues until all the cold water in bottom of boiler has been carried to the surface and heated and the hot water has settled down to replace it. Thus all the water becomes heated to an even temperature ready for making steam in about an hour.

SPECIFICATIONS

Size of Feed and Suction Pipes	Horse Power of Stationary Boilers at 30 lbs. of Water per H.P.	Price of Feed Water Circulator	Price Steam Heating	Price Total	Size Branch Suction Pipes	Size of Tees on Branch Suction Pipes
1¼ inch	55 to 110 H.P.	$30.00	.....	.....	1 inch	½" x ½" x 1"
1½ "	80 " 160 "	40.00	.....	.....	1¼ "	¾" x ¾" x 1¼"
2 "	140 " 280 "	50.00	$40.00	$90.00	1½ "	1" x 1" x 1½"
2½ "	220 " 440 "	60.00	50.00	110.00	2 "	1¼" x 1¼" x 2"
3 "	320 " 640 "	70.00	60.00	130.00	2½ "	1½" x 1½" x 2½"

The above prices are for the Machines only and do not include Piping, Fittings, or Erection. Estimates for Piping and Erection will be furnished when requested.

THE UNITED STATES GRAPHITE CO.

SAGINAW, MICH., U. S. A.

MINERS OF GRAPHITE & MANUFACTURERS OF GRAPHITE PRODUCTS

U. S. G. CO.'S MEXICAN BOILER GRAPHITE

The United States Graphite Co.
U.S.G. Co's Mexican Boiler Graphite
Saginaw, Mich. U.S.A.

The Graphite when introduced in the boiler feed works through and beneath the already formed scale and loosens it so that it either sloughs off or may be easily removed.

Then by mingling with the scale making elements present to some extent in all feed waters, the graphite keeps the formation soft and easily removable, or sometimes entirely arrests the development of scale.

U. S. G. Co.'s Mexican Boiler Graphite does this work by **mechanical action.** It has no chemical effect, cannot cause foaming, and under normal conditions cannot be carried out with the steam.

U. S. G. Co.'s Mexican Boiler Graphite, on account of its **mechanical action,** is effective in any feed water regardless of its character, and therefore saves the trouble and expense of frequent analyses.

Put up in barrels (about 400 pounds) and in 100 pound drums.

Those interested should send for testimonials and for Booklet "L" which goes into the subject thoroughly.

U. S. G. CO.'S No. 205 LUBRICATING GRAPHITE

There are two formations of graphite: crystalline or "flake" and amorphous or "powdered."

Flake graphite, no matter how finely pulverized, remains always in the form of mica-like flakes and is, as a matter of fact, incapable of really fine pulverization, which makes its presence in high grade lubricants undesirable.

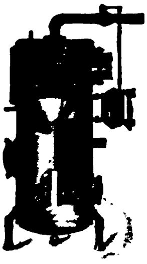
Amorphous graphite, on the other hand, is susceptible of reduction to a powder of impalpable and gritless fineness and is of a nature to combine intimately and permanently with oils and greases.

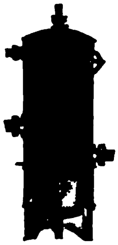
NO. 205 is the powdered kind of graphite—air-floated, absolutely gritless and accordingly vastly superior to the coarser grained and less finely pulverized "flake" graphite. It cools hot bearings while the machinery is running and then keeps them cool. Saves shut downs, time and trouble. For twenty cents in stamps to pay postage we will send once only a one pound can with full directions.

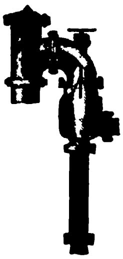
WM. BARAGWANATH & SON

CHICAGO, ILLINOIS

FEED WATER HEATERS, PURIFIERS, CONDENSERS, COOLING TOWERS, SEPARATORS.







FEED WATER HEATERS, STEAM JACKETED TYPE

(Vertical, Horizontal and Inverted)

In the STANDARD TYPE as here illustrated the steam enters the bottom, passes up through the tubes, and returns down the annular space between the inner shell and the jacket. The water is fed through the side near the bottom and passes to the boiler through the side outlet at the top. The steam jacket prevents radiation of heat from the water, and a higher degree of heat can be obtained than with any other closed heater made. Properly proportioned drips, blow offs, and hand holes are provided.

THE INVERTED TYPE is the same in all respects as the STANDARD TYPE, except that the steam enters and leaves at the top.

THE HORIZONTAL TYPE is designed for use in low basements and for marine service. It has all of the advantages of the STANDARD TYPE and is widely used where structural conditions make the use of the vertical type impossible or unadvisable. All types built in sizes from 50 H. P. up.

VERTICAL STEEL OPEN HEATER

(With Filter)

This HEATER is especially suited for use in muddy water. Also in connection with heating systems, acting as a receiving tank.

The water inlet is sealed. The water flows over a series of cast iron trays, then passing through a down pipe into the settling chamber in the bottom of the heater, from which it filters upwards through the filtering chamber to the pump supply.

An outside connected float operates a balanced valve on the supply pipe.

The pans are readily removable through a large door, provided for that purpose. Built in sizes from 50 H.P. up.

VERTICAL HOT WATER HEATER

This HEATER is designed especially for heating water for domestic purposes and is particularly adapted to hotels, restaurants, laundries and other buildings requiring large quantities of hot water.

The natural circulation through the central tube is accelerated by the flow of incoming cold water, creating a strong circulation and making both upper and LOWER water chambers reservoirs of HOT water, thus providing against a sudden demand for the maximum requirements for hot water.

The manholes provided in both water chambers allow easy access for cleaning and inspection. Built only to order.

BAROMETRIC CONDENSERS

THE BARAGWANATH BAROMETRIC CONDENSER is simple, reliable and economical. It is always set at an elevation (usually 33 ft.) above the hot well, so that the height of the column of water in the tail pipe is sufficient to clear itself automatically of the water and air it contains.

It is applicable to any purpose requiring a vacuum, and is used on engines, pumps, and vacuum pans with equal success. Except under special conditions of leaky connections, or very high vacuum requirements, no air pump is used.

THE K

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Sales Office
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Chicago, Ill.

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HEATER

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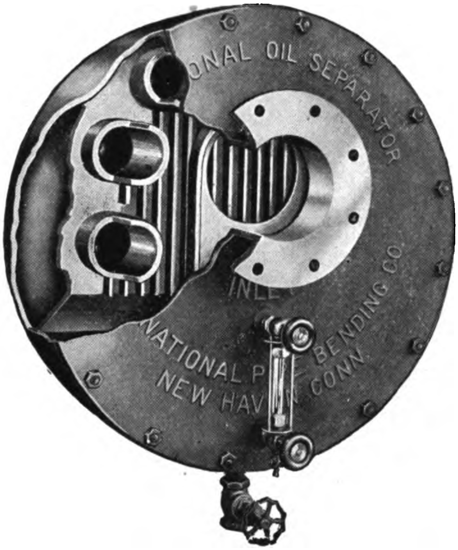
AND OIL SEPARA-

COPPER PIPE.

RIFIER

THE NATIONAL PIPE BENDING CO.

THE NATIONAL OIL SEPARATOR



Patent applied for

This gravity-type oil separator absolutely removes all grease or cylinder oil from exhaust steam so that the condensation may be used for feeding boilers, in laundry or dyehouse service, ice making, or for similar purposes. It has a multi-ported baffle plate, each port having an individual baffle, a distinctive feature found only in the National Separator. The large capacity of this separator not only insures effective separation of oil from exhaust steam but also overcomes the pulsations of exhaust, giving an even flow of steam.

NATIONAL CLOSED FEED WATER HEATER

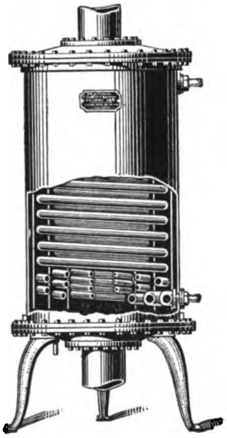
For use when the feed water need not be purified. In the National, the feed water is heated while being pumped through a coil of seamless-drawn brass or copper tubing surrounded by exhaust steam. The water is absolutely free from even a trace of oil, for it does not come in contact with the exhaust steam. The brass or copper has no effect on the water.

The enclosing shell is of cast-iron or steel plate; it lasts indefinitely because the feed water cannot reach it.

The economy resulting from the utilization of exhaust steam varies from 8 to 13 per cent of the coal burned, depending on conditions—temperature of feed water and boiler pressure; but other advantages are reduction of strains caused by feeding cold water, and increase in boiler capacity.

The National is safe—the coils are tested to 600 pounds water pressure, and the shell is subjected to exhaust pressure only.

More than 3,250,000 horse power of these heaters have been installed.



EDWIN BURHORN COMPANY

[illegible] WALL STREET NEW YORK CITY

WATER COOLING TOWERS. RIVETED PIPE. INTERNALLY FIRED BOILERS.

BURHORN AND ACME COOLING TOWERS

[illegible]

[illegible] TOWERS

[illegible]

[illegible]

[illegible]

Water Cooling Tower

INTERNALLY FIRED BOILER

[illegible]

[illegible]

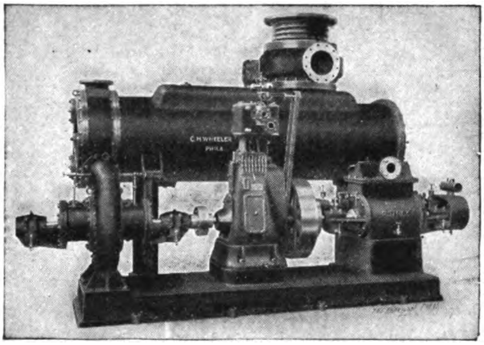
RIVETED STEEL PIPE

[illegible]

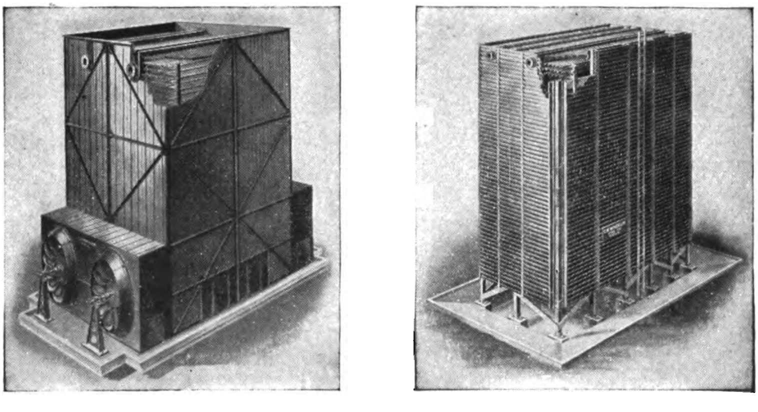
C. H. WHEELER MANUFACTURING COMPANY

Main Office and Works PHILADELPHIA, PA.

HIGH VACUUM APPARATUS FOR STEAM TURBINES: SURFACE, JET AND BAROMETRIC CONDENSERS; WATER COOLING TOWERS OF THE FORCED AND NATURAL DRAFT DESIGNS; VACUUM PUMPS OF THE RECIPROCATING, ROTARY AND HYDRAULIC ENTRAINMENT HIGH SPEED TYPES; CENTRIFUGAL PUMPS—MOTOR, ENGINE, TURBINE AND BELT DRIVEN. CLOSED FEED WATER HEATERS. SPECIAL TURBINE EXHAUST GATE VALVES. COPPER EXPANSION JOINTS. MULTIFLEX ATMOSPHERIC EXHAUST VALVES.



HIGH EFFICIENCY SURFACE CONDENSING EQUIPMENT consisting of a C. H. Wheeler Improved Surface Condenser with ROTREX Vacuum Pump and Centrifugal Circulating Pump, both mounted on a common base plate and direct connected to a Vertical Enclosed Self Lubricating Engine.



C. H. Wheeler-Pratt Improved Forced Draft Cooling Towers of steel, wood or concrete construction; also Natural Draft Wooden Cooling Towers.

WHEELER CONDENSER AND ENGINEERING CO.

MAIN OFFICE AND WORKS: CARTERET, NEW JERSEY

BRANCHES

[illegible] York, Boston, Philadelphia, Chicago, St. Louis, St. Paul, Cincinnati, Pittsburgh, Dallas, [illegible], Denver, San Francisco, Salt Lake City, Los Angeles, Seattle, Portland, Tucson, [illegible], Charlotte, New Orleans, Atlanta, London, Yokohama, Trieste, Melbourne, Paris.

MANUFACTURERS OF COMPLETE CONDENSING EQUIPMENTS

Wheeler Dry Tube Surface Condenser

Wheeler Rectangular Jet Condenser (Counter-Current [illegible] Type) for High Vacuum Steam Turbines

Wheeler Combined Surface Condenser Auxiliaries Comprising Turbine Circulating Pump and Combined [illegible] Pump

HIGH VACUUM SURFACE CONDENSERS.

For turbines of any capacity, condensing equipments operating on wet or dry system, tube surface of condenser arranged to give best distribution of steam for high efficiency and designed on the dry tube principle to give maximum rate of heat transmission. Built as base condensers for vertical turbines, also for horizontal turbines with either rectangular or cylindrical shells.

HIGH VACUUM JET CONDENSERS.

For turbines of any size to maintain vacuum of 28 inches and up. Built on the countercurrent "rain type" principle to insure maximum temperature of discharge water, and therefore, minimum quantity of water, and minimum pumping cost.

WHEELER TURBO AIR PUMPS.

High Speed Rotary type for jet or surface condensers. Direct connected to turbine or motor. Will maintain 98-99% vacuum.

WHEELER-EDWARDS AIR PUMPS FOR AIR AND CONDENSATE.

Eliminate [illegible] and hot well pumps. [illegible]

WHEELER [illegible] VACUUM PUMP

Will maintain [illegible]

CENTRIFUGAL PUMPS FOR ALL SERVICES.

Circulating [illegible]

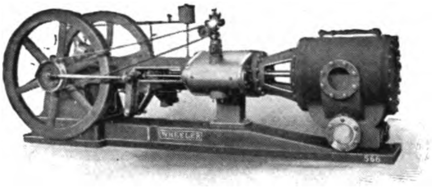
FORCED DRAFT COOLING TOWERS.

[illegible]

NATURAL DRAFT COOLING TOWERS.

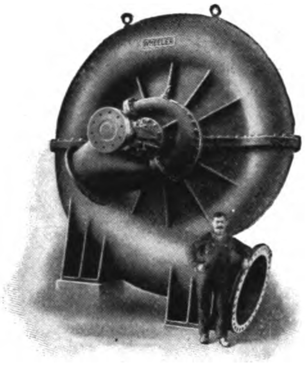
For [illegible]

WHEELER CONDENSER AND ENGINEERING CO.



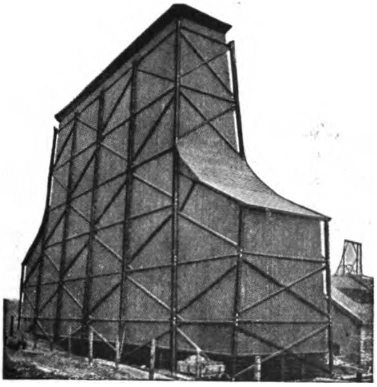
Wheeler Rotative Valve Reciprocating Dry Vacuum Pump

Wheeler Barometric Condenser

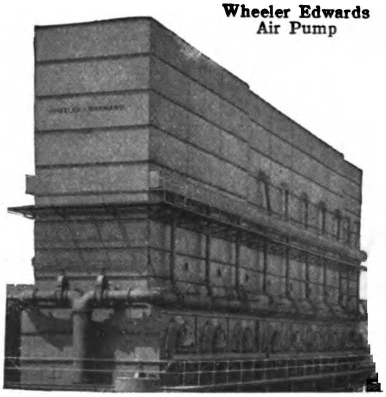


Wheeler Centrifugal Pump

Wheeler Edwards Air Pump



Wheeler-Balcke Natural Draft Wooden Cooling Tower



Wheeler-Barnard Forced Draft Cooling Tower

HENRY R. WORTHINGTON

[illegible] Broadway, NEW YORK Works: HARRISON, N. J.

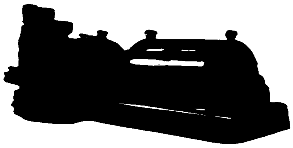
MANUFACTURERS OF TURBO-BLOWERS AND TURBO-COMPRESSORS. SURFACE, BAROMETRIC AND CENTRIFUGAL JET CONDENSING SYSTEMS, COMPLETE WITH AUXILIARIES FOR HIGH VACUUM WORK:—COOLING TOWERS. DUPLEX DIRECT-ACTING, CENTRIFUGAL, TURBINE PUMPS FOR EVERY SERVICE. BOILER FEED, ELEVATOR, FIRE PRESSURE PUMPS. WATER METERS: WATER WORKS, SEWAGE AND DRAINAGE PUMPING ENGINES

TURBO-BLOWERS AND TURBO-COMPRESSORS

Turbine or Motor Driven

[illegible] PRESSURE AND CAPACITY

Motor Driven Turbo-Blower
Capacity [illegible] cu. ft.
per minute, [illegible] lbs.
Gage Pressure



Turbo-Compressor, Driven by
Mixed-Pressure Turbine. Capacity [illegible] cu. ft. per min.
[illegible] lbs. Gage Pressure

Write for Bulletin W. [illegible]

WORTHINGTON CONDENSING APPARATUS

[illegible]

[illegible] Condensing [illegible]

Write for Catalogue [illegible]

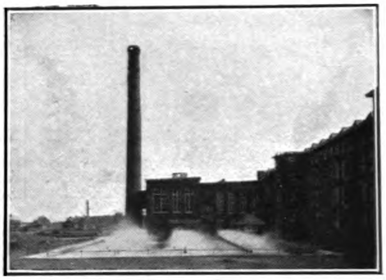
[illegible] W3G.5

SPRAY ENGINEERING COMPANY

201 Devonshire St., BOSTON, MASS.

MANUFACTURERS OF SPRAY NOZZLES, ASPHALT ROAD SPRAYERS, AERATING NOZZLES, OIL BURNERS, PARK SPRINKLERS. ENGINEERS FOR AERATING RESERVOIRS, COOLING PONDS, IRRIGATION SYSTEMS, AIR WASHERS.

SPRAY COOLING PONDS



4000 H.P. Sharp Mfg. Co., New Bedford, Mass.

Wherever water has to be cooled for condensers, transformers, or water jackets, a spray system properly designed, will be found to be the most efficient and by far the simplest and most economical to operate. It also costs much less to install than any other system of cooling water, and where there is an existing pond, the cost is limited to the spray nozzles and piping.

The spray system affords a simple remedy by which many power plants, now handicapped with hot condensing water, can reduce their operating expense. With the introduction of steam turbines, better vacuum and therefore colder condensing water have become a necessity, and it is mainly the great cooling capacity which our spray systems possess that has led to their adoption in connection with many of the largest power plants. *The yearly saving effected by our spray cooling system will generally pay a 50% return on its cost.*

The Spray Nozzle is the most important feature of a cooling system. Its office is to produce a fine uniform spray at a low operating pressure, without clogging. These requirements have been successfully accomplished by the design of our nozzles. A high grade of bronze, smooth finished, is used for both shell and center, with ample metal provided at all wearing points, and assures a low rate of depreciation. Under ordinary conditions, the power necessary to operate our sprays will *average less than 1% of the power generated by the engine.*

Next in importance to the design of the nozzle is the arrangement of the sprays. In our system the nozzles are arranged in groups and inclined towards opposing nozzles. This results in a finer spray and therefore a greater cooling effect.

For spray-cooling ponds we recommend nozzles of the following sizes and capacities. The height of the spray will approximate 1 ft. for each pound of operating water pressure.

Spray Nozzle	Diameter of Orifice	Diameter of Supply Pipe	Capacity in Gallons per Minute			
			At 5 lbs. Pressure Per Sq. Inch	At 8 lbs. Pressure Per Sq. Inch	At 10 lbs. Pressure Per Sq. Inch	At 15 lbs. Pressure Per Sq. Inch
No. 10	½″	1½″	13	17	21	23
11	¾″	2″	50	60	66	77
12	1″	2½″	75	92	105	135
13	1¼″	3″	..	105	120	160

Bulletin No. 23 covering full details will be gladly sent upon request.

AIR WASHERS

The two important elements in the design of an Air Washer are the cooling and washing effects and the power requirements. Our superiority in the coolin and washing effect results from the character of the spray formed with special nozzles. In our design the water is sprayed in the same direction as air and the power requirement of our Washer will be found to be much lo than that of most other types. Fully described in Bulletin No. 52.

If you are interested send for bulletins on

Cooling Condensing Water **Burning Oil** **Moistening Air** **Washing**
Spraying Road Binders **Park Sprinkling** **Cooling Liqu**

FOUNDRY

HOT WATER, BRINE,
GAS AND AIR; GLOBE
BENDING MACHINERY;

WORKS

METER

Recording Instruments,
instrument, which is
space where the
meter is given in Bulletin

WATER METER

Discharge Lines,
etc. Our
data.

MEASURING

	per 24 Hours	
		Maximum
		843000
		520000
		4680000
		8320000
		13000000
		18720000
		18720000
		29250000
		42120000
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measurement in had
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No. 68

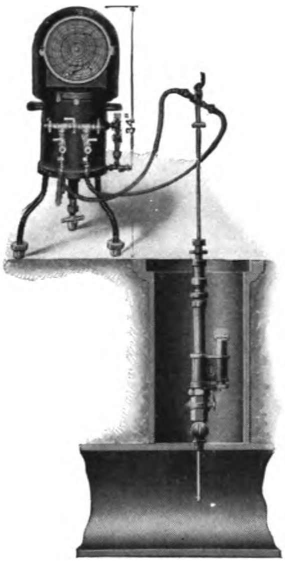
METER

among which
and Low Cost

SIMPLEX VALVE AND METER COMPANY

PHILADELPHIA, PA.

WATER METERS OF VENTURI AND PITOT TUBE TYPE, RATE OF FLOW CONTROLLERS, LOSS OF HEAD, RATE OF FLOW AND WATER LEVEL GAUGES, ALTITUDE VALVES FOR RESERVOIRS AND RAILROAD WATER TANKS, AUTOMATIC AIR AND VACUUM VALVES, CHEMICAL FEED DEVICES AND OTHER HYDRAULIC APPARATUS OF SPECIAL DESIGN.



The Simplex type "G" register is adapted for use with Venturi tubes and with pitot tubes. For this latter purpose it is furnished in both stationary and portable form. The illustration shows the portable type.

This recorder is particularly useful in making leakage surveys in a water works system, or testing the flow through any size pipe. The charts are graduated in velocity in feet per second. The tap and pipe connections are one inch in diameter. The instrument will record all flows from half a foot per second up to ten feet per second, or any desired maximum.

In the stationary form the instrument is well suited for use as a pumping station meter, where it is impossible to install a Venturi tube.

[illegible] Inc.

[illegible]

[illegible] WILCOX WATER WEIGHER

[illegible] Weigher [illegible]

The Wilcox Water Weigher is a device for automatically weighing and recording the water [illegible] It takes water [illegible] source [illegible] water heater, tank, pump, or [illegible] any rate of flow or varying rates, and [illegible] it intermittently in charges of uniform [illegible]

[illegible] weigh hot feed water from an open [illegible] water from [illegible] water of condensation [illegible] vacuum pumps or heating systems [illegible] oils, sugar juices, etc.

Operation: The charge is weighed by [illegible] through the medium of [illegible] The first charge is immediately [illegible] the release of the entrapped [illegible] an extremely accurate method of weighing.

Accuracy: Each weigher is guaranteed to weigh within one per cent of correct accuracy at any rate of supply up to its maximum capacity.

Styles and Capacities: The Wilcox Water Weigher is built in several styles of [illegible] various [illegible] for evaporative and condensing tests and power [illegible] All capacities from one thousand pounds [illegible] pound.

[illegible] sketches and plans for proposed installations [illegible] by the Wilcox Engineering Company. We [illegible] for the purpose of assisting prospective [illegible] to meet local conditions.

[illegible] Plants. By furnishing a simple, reliable automatic [illegible] accurately recording every pound of [illegible] Wilcox Water Weigher offers a means of segregating [illegible] performance, thereby [illegible] whether [illegible] proper [illegible]

[illegible]

The Wilcox Automatic Water Weigher with Storage Tank. Type A.

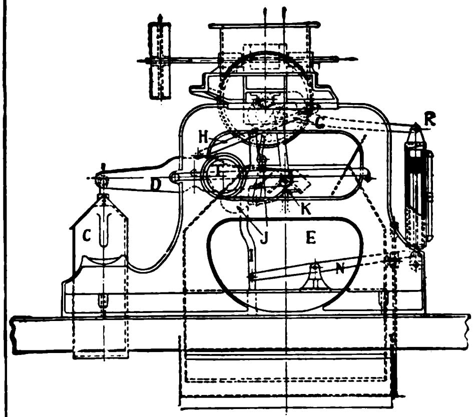
RICHARDSON SCALE COMPANY

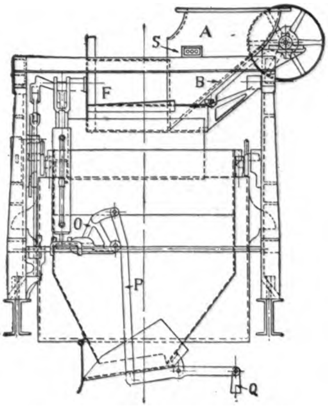
Head Office and Works, 17 Colfax Ave., PASSAIC, N. J.

New York: 14 Park Row Building Chicago, 209 So. State Street

BUILDERS OF AUTOMATIC WEIGHING MACHINERY

GRAVITY OPERATED COAL SCALE





The framework is of cast iron. The weigh hopper E, made of or lined with sheet monel metal, is supported on the cast steel beam D, and counterbalanced by the cast iron weight box C, which is loaded with standard dead weights for the required quantity of coal to be weighed. The feed gate F, which is also lined with non-corrosive metal, is opened by means of the pendant X, which is actuated by the beam D. The power to operate is derived from the weights in the box C.

When the exact amount has entered the hopper E, the gate automatically closes, and is locked by the toggle levers H and J. The load in the hopper is emptied by the unlocking of the toggles O and P. The return of the beam and the shock of the weights supported by it are cushioned by means of the counterweight R and the air cushion Z. There are no springs in this scale.

The coal is fed through the chute A, and if it is soft coal a reciprocating plate feeder B worked by an eccentric evenly feeds the coal through the gate F into the hopper E.

The machine is self-testing, and the beam balances on every draft.

THE RICHARDSON AUTOMATIC WEIGHING MACHINERY

The scale described above is built in sizes having the following hopper capacities: 100, 200, 300, 500, 1000, 1500, 2000 and 3000 lbs., the corresponding hourly capacities being: 4, 8, 15, 25, 50, 75, 100 and 150 tons.

This machine is largely used in suitable sizes, for weighing coal as received in power stations and for checking coal as delivered from overhead bunkers either to mechanical stokers or to the boiler room floor.

We also supply THE MERRICK PATENT WEIGHTOMETER or Conveyor Scale, and an Automatic Water Scale.

We have been building these scales for the past twenty-five years, and many notable installations and repeat orders testify as to their reliability.

BEST MANUFACTURING CO.

PITTSBURGH, PA.

SALES OFFICES

New York   Philadelphia   Cleveland   Chicago

MANUFACTURERS OF PIPING MATERIALS FOR STEAM, AIR AND HYDRAULIC PIPING SYSTEMS, VALVES, FITTINGS, FLANGES, FLEXIBLE JOINTS, PIPE BENDS, FABRICATED PIPE, VANSTONE JOINTS, WELDED HEADERS, SEPARATORS, ETC. GENERAL IRON CASTINGS

PIPING FOR POWER HOUSE, MINE, MILL, ETC.

Screwed

Vanstone

[illegible] we [illegible] specialized in power piping for more than [illegible] years. We contract to furnish all kinds of piping [illegible] and fitted ready for erection or installed and tested, ready for operation. We are prepared to furnish pipe and bends for any steam pressure to be made, in any size pipe of seamless steel or wrought iron, also brass or copper. We flange pipe and bends in any known manner: Screwed, Threaded, Shrunk, Vanstone or Welded.

We also weld all our seamless headers producing [illegible] Welded Steel Header and thus reduce to a minimum the number of flanged joints. Our headers of this type have been in use for years, [illegible] very satisfactory service.

Our foundry is equipped to furnish special [illegible] for [illegible] in any shape and size up to 50-ton castings.

"BEST" FLANGED FITTINGS

"Standard" Flanged Fittings, designed for a steam working pressure of 125 pounds, are from good [illegible] patterns and are made of a fine uniform grey foundry iron.

"Low Pressure" Fittings are made of the same foundry iron as our Standard and are designed for a pressure of 25 pounds steam.

"Extra Heavy" Fittings are made from high grade foundry iron or semi-steel for a working pressure of 250 pounds steam. Hydraulic Fittings are made from cast steel or steel for any desired working pressure.

All of our fittings are machined by machinery wherever possible, thereby insuring uniformity in size as well as appearance. A large assorted stock enables us to make prompt shipments of staple sizes.

STANDARD FLEXIBLE JOINTS

"Moran" Type Joint

The Moran type of flexible joint for heavy service is made entirely of iron, but if so specified, will be furnished made of brass. It is suitable for steam, air, or liquid, and is tight under pressure, yet free to move readily to the limit of its flexibility, without affecting the joint. Sizes ¼ inch to 6 inches inclusive.

"Best" Joint

The Best "Tight and Loose" flexible joint is made with an iron body joint and a reversible brass ring, forming a brass to iron joint, suitable for heavy service. Having a reversible ring, it can be put together as a tight adjustable or a loose flexible connection, according to the conditions of the pipe installation. Sizes ½ inch to 2 inches inclusive.

Sizes of both types of joints from ½ inch to 2 inches are good for working pressure to 150 pounds steam, 200 pounds water, 250 pounds air and from 2½ inches to 6 inches for working pressure to 100 pounds steam, 125 pounds water, 150 pounds air.

BEST MANUFACTURING CO.

VALVES

The line of "Best" Valves is summarized as follows:

IRON BODY: **Low Pressure** for Vacuum and 25 pounds steam.

Back Pressure; Automatic Exhaust Relief; Combination Exhaust Relief and Back Pressure; Parallel Seat, Split Wedge Gates and Transfer Valves.

Standard for 125 pounds steam.

Parallel Seat, Split Wedge Gate Valves; Globe, Angle and Cross Valves.

Miscellaneous

Gulland Automatic Cushioning Water and Float, Gate with Clean-Out Pocket, and Snort Valves.

SEMI-STEEL: **Medium** for 175 pounds steam.

Globe, Angle and Cross Valves; "Best" Adjustable Wedge Gate Valves.

Extra Heavy for 250 pounds steam.

Globe Valves; "Best" Double Adjustable Ball Wedge Gates.

We recommend Gate Valves having one piece stems and no pin in the disc holder.

Extra Heavy Hydraulic for 800 pounds water.

Swing Check, "Best" Adjustable Gate, and Climax Three and Four Way Operating Valves

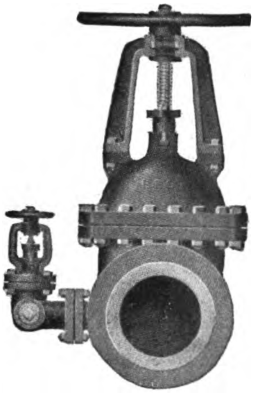
CAST-STEEL: **Extra Heavy** for 250 pounds steam.

Globe and Angle, Swing Check and "Best" Adjustable Wedge Gate Valves.

Special Hydraulic for 1500 pounds water.

Swing Check and "Best" Adjustable Wedge Gate Valves.

"BEST" GATE VALVES



Extra-Heavy and Hydraulic

Cast-Steel "Superheat"

These valves are built on strong construction lines and will withstand heavy duty and abusive service.

The Low Pressure and Standard Valves have a split disc and parallel seats; others have our Patented "Best" Split Adjustable Ball Wedge which adjusts itself to even the slightest change in the angle of the valve seats due to the distortion of the valve body by expansion strains, etc.

"Best" Steel Valves for high temperatures have Monel metal trimmings and one-piece, pinless, Monel metal stems and are unexcelled for use in superheated steam lines.

All metals entering into the construction of our valves are poured in our own factories, insuring uniformity of product. Valves are finished in special machines by skilled mechanics and parts are interchangeable; hydraulic tests determine their serviceability before they are shipped as "Best" Valves.

"Best Model Piping Specifications," a text book on piping, and our complete catalogue No. 103 sent upon request.

THE CHAPMAN VALVE MFG. CO.

INDIAN ORCHARD, MASS.

GATE VALVES SLUICE GATES FIRE HYDRANTS

STEEL PARALLEL SEAT DOUBLE GATE VALVE
FOR SUPERHEATED STEAM
STEEL BODIES AND BONNETS, MONEL METAL GATES AND SEATS
STRAIGHTWAY TYPE

Fig. 312 is a cut of the interior working parts, showing the carrier block extended to carry an opening the full size of the pipe line, so that when the valve is fully open the seats are covered and the pipe line is made continuous, the carrier extension effectually filling up the aperture around the seats.

The valve when open is the same as if it were a continuation of the pipe line, with neither contractions or apertures of any kind to deflect or break up the flow of the steam. This construction not only prevents the loss of head due to eddying, but it also protects the seats from injury.

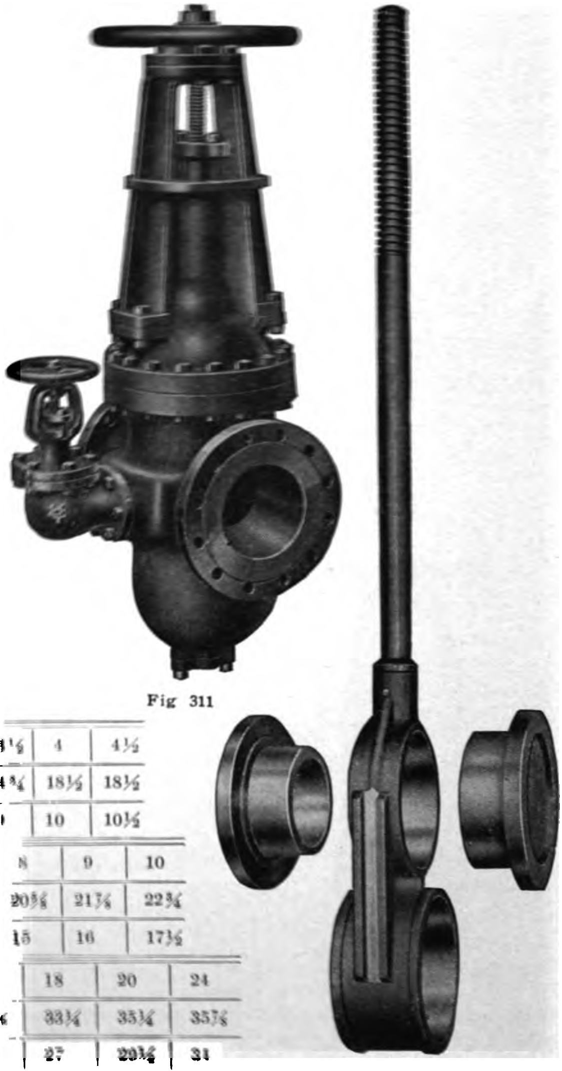


Fig 311

Fig 312

Diameter of Port or Size—A
Face to Face Flanges—B
Diameter of Flanges C

A	2	2½	3	3½	4	4½
B	10¼	12½	14	14¾	18½	18½
C	6½	7½	8¼	9	10	10½
A	5	6	7	8	9	10
B	18¾	19	20	20⅝	21⅞	22¾
C	11	12½	14	15	16	17½
A	12	14	16	18	20	24
B	23¾	25⅞	32⅞	33¼	35¼	35⅞
C	20	22½	25	27	29½	31

PAGES 94-95 CATALOGUE NO. 30

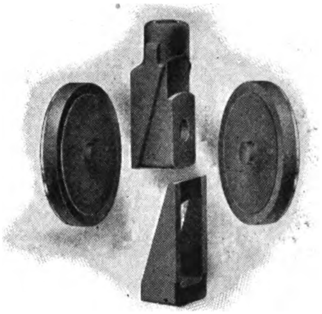
THE DARLING PUMP & MFG. CO. Ltd.

WILLIAMSPORT, PA.

SALES OFFICES:

New York City	Chicago	Philadelphia
149 Broadway	The Rookery	Arcade Building

DARLING GATE VALVES, FIRE HYDRANTS, INDICATOR POSTS, FLOOR STANDS, VALVE BOXES, BALL CHECK VALVES, MADE FOR ALL PRESSURES AND PURPOSES.



Wedging Mechanism—Shown with Parts Separated

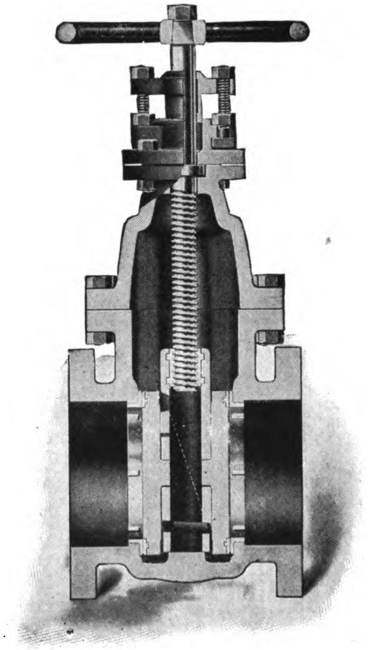
The Gate Discs being plain, no portion of the Wedging Mechanism is formed upon them. These Gate Discs revolve independently of the wedges, and independently of each other. The Revolving Gate Discs change their positions on the Seats each time the Valve is closed, thus distributing wear equally over entire Faces of Gates and Seats, ensuring Durability.

Gates Released Before Opening, Avoiding Wear on Seats.

Cannot Stick or Bind.

Simple, Reliable, Durable.

The Darling Patented Gate Valve has Parallel Seats, Double Revolving Gate Discs and Compound Equalizing Wedges. The Wedging Mechanism operates Between the Gate Discs and Independent of them.



Sectional View of Inside Screw Valve with Flanged Ends

CRANE CO.

536 So. Michigan Ave., CHICAGO, ILL.

Cable address, [illegible], Chicago. **Branches in Forty-four Cities.**

CAST STEEL VALVES AND FITTINGS; CRANETILT STEAM TRAPS; VALVES, COCKS AND FITTINGS IN BRASS, MALLEABLE IRON AND CAST IRON; STEAM SPECIALTIES; COMPLETE PIPING EQUIPMENT; PIPE BENDS; PIPE FITTERS' TOOLS; ENGINEERS' SUPPLIES, ETC.

CRANE CAST STEEL VALVES AND FITTINGS

[illegible] been manufacturing for some time a line of steel fittings to meet a steadily growing demand for a superior grade of goods, especially adapted for High Pressure Saturated and Superheated Steam Lines and Extreme Hydraulic Service. These are suitable for steam working pressures up to [illegible] pounds and for superheat up to a total temperature of [illegible] degrees.

No. [illegible]A

[illegible]

Nos. 2[illegible]A, 23A and B, 2[illegible]A, 30A and B

Cast steel body [illegible] yoke and [illegible] Monel Metal or steel stems.

No. 101D and No. 105D

Extra Heavy Cast Steel Flanged Fittings.

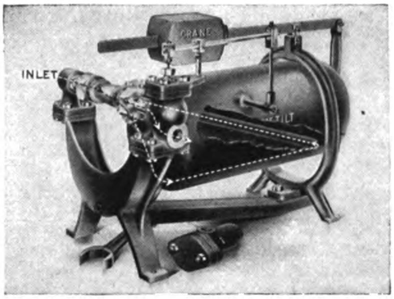
We carry the following steel goods in stock:

No. [illegible]A Straight-Way Valves Outside screw and yoke [illegible] seats and Monel Metal stem	12 inch and smaller
No. [illegible]A Straight-Way Valves Inside screw and [illegible] seats and Monel Metal stem	14 inch and smaller
No. 2[illegible]A Globe Valves Outside screw and yoke [illegible] seats and Monel Metal stem	6 inch and smaller
No. 23A and B Angle Valves Outside screw and [illegible] seats and Monel Metal or cold rolled steel stems	6 inch and smaller
No. 101D Steel [illegible] Straight sizes	12 inch and smaller
No. 105D Steel [illegible] Straight sizes	12 inch and smaller
Screwed Elbows Straight sizes	4 inch and smaller
Screwed Tees Straight sizes	4 inch and smaller

Further particulars [illegible] Catalogue No. 70, October 1910.

CRANE CO.

CRANETILT STEAM TRAPS

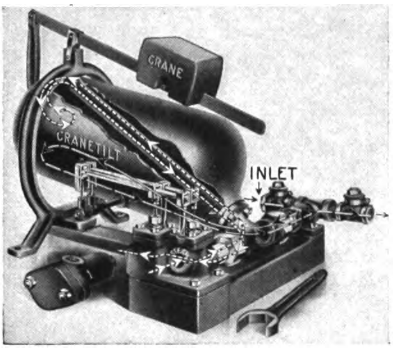


NON-RETURN PATTERN

The receiving or tilting tank is made of malleable iron, cast in one piece of uniform thickness. They are tested to 800 pounds hydraulic pressure per square inch and are fully capable of withstanding the severe strains to which Tilting Traps are subjected.

All operating parts are on the outside and the Discharge Valves are of special design, having exceptionally large openings. The brass working parts are made of "Crane Hard Metal" which has wearing qualities almost equal to steel and successfully resists the cutting effects of steam and water.

		Pipe Connections	Capacities per Hour Based on Ordinary Condensing Conditions		Dimensions	
Size of Trap Number	List Price including Sediment Trap, but no Check Valves or Fittings	Size of Inlet and Outlet Inches	Lineal Feet of 1 Inch Pipe Trap will Drain with 50 lbs. Pressure at the Trap	Pounds of Water Discharged with 50 lbs. pressure at the Trap	Over All Inches	Extreme Height Inches
30	$25.00	¼	6,000	1,200	19½x12	19¾
32	45.00	½	15,000	3,000	24½x14⅝	24½
33	55.00	¾	30,000	6,000	28 x18¼	28
34	85.00	1	50,000	10,000	32½x20½	31
35	115.00	1¼	75,000	15,000	36 x23	33
36	150.00	1½	100,000	20,000	42 x25½	36
37	200.00	2	150,000	30,000	47½x29⅛	41
38	300.00	2½	200,000	40,000	54 x33⅛	50
39	425.00	3	250,000	50,000	61 x37¾	56



DIRECT RETURN PATTERN

This pattern will automatically return all condensations, at any pressure or temperature, directly back into the boiler. Direct Return Traps require live steam from the boiler for their operation, which is automatically controlled through the steam port of the Duplex Valve. Cranetilt Steam Traps will handle condensation from all sources, under any condition of service, and under any pressure up to 250 pounds. They also have a maximum discharging capacity. Each trap is given a thorough steam test and guaranteed in perfect working order before shipment.

		Pipe Connections		Capacities per Hour Based on Ordinary Condensing Conditions		Dimensions	
Size of Trap Number	List Price including Sediment Trap, Two Swing Check Valves, Tee and Nipples	Size of Water Inlet and Discharge Inches	Size of Steam and Vent Valve Inches	Lineal Ft. of 1 Inch Pipe Trap will Drain	Pounds of Water Trap will Discharge into Boiler	Over All Inches	Extreme Height Inches
90	$60.00	½	½	4,000	800	25 x15¾	27
91	75.00	¾	¾	7,500	1,500	28¼x19⅛	31
92	100.00	1	1	12,500	2,500	33 x21¾	36
93	150.00	1¼	1¼	18,000	3,600	37½x24½	38
94	200.00	1½	1½	25,000	5 000	42½x27	42
95	300.00	2	2	39,000	7,800	51½x30¼	50
96	400.00	2½	2½	57,500	11,500	60 x34½	55
97	550.00	3	3	77,500	15,500	68 x38¾	65
98	750.00	4	3	140.000	28.000	76 x44¾	70

(See also following pages)

[illegible]

(Continued from preceding page)

CRANE CO.

CHICAGO, ILL.

SUMMARY OF CRANE PRODUCTS

[illegible] description of our line. We carry [illegible] of the goods listed below and are [illegible] SPECIAL VALVES, FITTINGS, etc., to meet specific re[illegible]

[illegible] STANDARD [illegible] those goods intended for working steam [illegible] The LOW PRESSURE FITTINGS, etc., [illegible] WORKING PRESSURES up to 25 pounds, while the [illegible] 225 pounds. The EXTRA HEAVY [illegible] WORKING PRESSURES up to 250 pounds.

[illegible] WATER WORKING PRESSURES may be taken as [illegible] STANDARD and MEDIUM, 40 per cent greater than [illegible] 12 inch and smaller, sizes 14 inch and larger 20 per [illegible]

STANDARD GOODS

We manufacture brass GLOBE, ANGLE and CROSS VALVES screwed in sizes from ⅛ to 4 inches; and the flanged pattern from ¾ to 4 inches. The brass CHECK VALVES are made in many patterns, the sizes of which run from ⅛ to 3 inches. The brass line also includes: HOSE, GARDEN HOSE, COKE OVEN, NEEDLE POINT, STRAIGHT-WAY and HOSE GATE. The lines of RADIATOR VALVES and FITTINGS, BRASS, STEAM and GAS COCKS are complete. The CAST IRON FITTINGS include COCKS in various patterns; GLOBE, ANGLE and CROSS VALVES with yoke as well as the regular patterns; the sizes of the latter ranging from ½ to 3 inches. We make BRASS and CAST IRON PIPE FITTINGS in both the screwed and flanged patterns as well as MALLEABLE PIPE FITTINGS screwed. With the STANDARD GOODS are also included IRON STRAIGHT-WAY VALVES, EXPANSION JOINTS with iron body and brass sleeve, RAILING FITTINGS, DRAINAGE FITTINGS, STEAM FITTERS' and ENGINEERS' TOOLS, PIPE BENDS, and PIPE SUPPORTS, BRACKETS, etc.

LOW PRESSURE GOODS

The ALPHA STRAIGHT-WAY WEDGE GATE VALVES have been designed for use in connection with hot water and low pressure steam heating systems and plumbing, and are made in sizes ranging from ½ to 2 inches. The regular low pressure STRAIGHT-WAY or WEDGE GATE VALVES are made in several patterns and in sizes up to 72 inches. The low pressure PIPE FITTINGS are of the flanged pattern and include ELBOWS, 45 degree ELBOWS, TEES, REDUCING TEES, CROSSES, REDUCING CROSSES, LONG RADIUS ELBOWS, SQUARE and ROUND BASE ELBOWS and TAPER REDUCERS.

MEDIUM PRESSURE GOODS

[illegible] CHECK [illegible] made [illegible] inches. [illegible] STRAIGHT-WAY [illegible] either screwed or flanged [illegible] CROSSES [illegible]

CRANE CO.

EXTRA HEAVY GOODS

Under this heading will be found FERROSTEEL STRAIGHT-WAY VALVES in ten patterns, including the ELECTRICALLY and CYLINDER OPERATED DESIGN; the sizes run up to 24 inches and larger. The FERROSTEEL GLOBE, ANGLE and CROSS VALVES are made with yoke, have hard metal seats and are flanged; the sizes range from 2 to 15 inches. The EXTRA HEAVY VALVE line also include SWING CHECK VALVES, flanged sizes from 2 to 15 inches; GLOBE and ANGLE THROTTLE VALVES, flanged, in sizes from 3 to 8 inches; AUTOMATIC STOP-CHECK VALVES in GLOBE and ANGLE PATTERN, flanged, sizes 2 to 15 inches; EMERGENCY STOP VALVES in sizes from 4 to 16 inches; EXPANSION JOINTS—iron body and brass sleeve, in sizes 2 to 18 inches—these are also made with special traverse and extra long traverse; BALANCED EXPANSION JOINTS; SWIVEL EXPANSION JOINTS; GLOBE, ANGLE, CROSS and CHECK VALVES; REGRINDING SWING CHECK VALVES; HORIZONTAL CHECK VALVES; UNIONS, ROUGH BRASS FITTINGS, MALLEABLE IRON FITTINGS, CAST IRON FLANGED FITTINGS, GASKETS, FLANGED PIPE JOINTS.

HYDRAULIC GOODS

All of these articles have been designed for water working pressures up to from 800 to 1200 pounds. The line includes STRAIGHT-WAY VALVES outside screw and yoke with or without by-pass in sizes from 1½ to 12 inches; SWING CHECK VALVES in sizes from 2½ to 12 inches; GLOBE, ANGLE and CHECK VALVES, MALLEABLE IRON FITTINGS, BRASS UNIONS, FERROSTEEL FLANGED FITTINGS and COMPANION FLANGES for pressures up to 2500 pounds; CAST STEEL HYDRAULIC VALVES, FITTINGS and FLANGES for pressures up to 3000 pounds.

PIPE

We can supply promptly SEAMLESS DRAWN BRASS and COPPER TUBING in iron pipe sizes, STANDARD WEIGHT SPIRAL RIVETED PRESSURE PIPE, STRAIGHT SEAM STEEL RIVETED PIPE, and WROUGHT PIPE—either black or galvanized.

SPECIALTIES AND TRIMMINGS

These are AUTOMATIC EXHAUST RELIEF VALVES, AUTOMATIC STOP CHECK VALVES, CHICAGO and NAVY UNIONS, BOILER FITTINGS, CRANE CEMENT for making tight pipe joints, STEAM WHISTLES, WATER GAUGES, OIL and GREASE CUPS, LUBRICATORS, COCKS, PRESSURE and VACUUM GAUGES, FUSIBLE PLUGS, BACK PRESSURE VALVES, LEVER SAFETY VALVES, POP SAFETY VALVES, BLOW-OFF VALVES, BLOW-OFF CROSSES, PRESSURE REGULATORS, FLOAT VALVES, EXHAUST PIPE HEADS, INJECTORS, AUTOMATIC DUPLEX FEED PUMPS and RECEIVERS, PUMPS, FLEXIBLE JOINTS, KLINGERIT PACKING, E. C. & B. PIPE MACHINES, STEAM and OIL SEPARATORS, CRANE VACUUM OIL SEPARATORS, MACHINE BOLTS.

POCKET CATALOGUE

We have just issued a new edition which will be found very complete a useful. It is designated as No. 40 and dated May 1913.

HOMESTEAD VALVE MANUF'G CO.

PITTSBURGH, PA.

THE HOMESTEAD SELF-LOCKING STRAIGHTWAY, THREE-WAY AND FOUR-WAY HIGH PRESSURE BALANCED PLUG VALVES. THE HOMESTEAD LOCKING COCK.

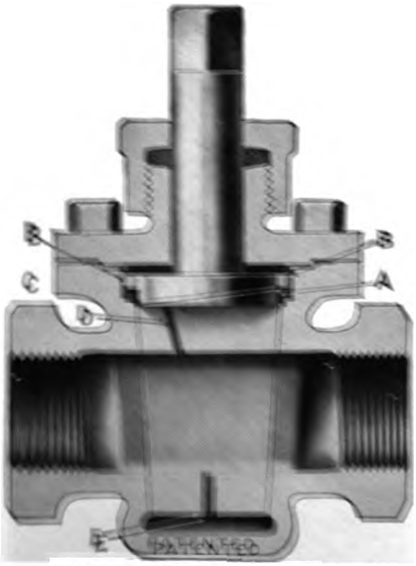
THE HOMESTEAD SELF-LOCKING STRAIGHTWAY VALVE

This valve is unlike all others for the reason that when the pressure passes through it the seat is ABSOLUTELY PROTECTED FROM WEAR. The plug is balanced and held in place by the pressure when open, and when closed it is locked in the seat by our patent wedging cam, insuring freedom from friction in seat while plug is turning, which makes ours the quickest acting, simplest made, easiest operated and most durable valve known. Globe and Gate Valves, on the other hand, have their vital parts (Seats) EXPOSED to pressure and destruction every moment they are open.

CONSTRUCTION

This valve is so constructed that when it is closed it is at the same time forced firmly to its seat. This result is secured by means of the traveling cam "A" through which the stem passes. The cam is prevented from turning with the stem by means of the lugs "B" which move vertically in slots. Supposing the valve to be open, the cam will be in the lower part of the chamber in which it is placed, and the plug will be free to be easily moved. A quarter of a turn in the direction for closing it causes the cam to rise and take a bearing on the upper surface of the chamber, and the only effect of further effort to turn the stem in that direction is to force the plug more firmly to the seat. A slight motion in the other direction immediately releases the cam and the plug turns easily, being arrested at its proper open position by contact of the fingers of the cam at the other end of its travel. E. D. D. are balancing ports which allow the pressure to predominate at the top of plug, holding it gently in its seat while valve is open. Made in all sizes up to six inches, and for all pressures up to 5,000 pounds per square inch. Made in Straight Way, Three and Four-Way Patterns.

For Steam, Compressed Air and Hydraulic Service.



Homestead Straightway Valve

THE HOMESTEAD LOCKING COCK

A simple with a slight [illegible] locking device which [illegible] adherence of the plug to the seat [illegible] and [illegible] the quarter turn [illegible] a limiting [illegible] any turning [illegible] free from wear [illegible]

The Homestead Locking Cock

THE KELLY & JONES CO.

GREENSBURG, PA.

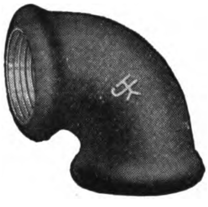
MANUFACTURERS OF BRASS AND IRON PIPE FITTINGS, BRASS AND IRON VALVES, COCKS, ETC., FOR STEAM, GAS, WATER, AIR AND OIL.

Cast Iron Fittings

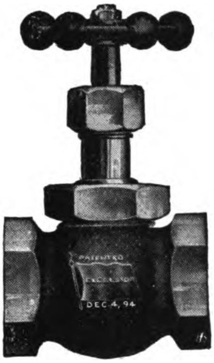
CAST IRON FITTINGS

All styles, screwed or flanged for all pressures.

All K. & J. cast iron fittings are made of the best grade iron, threads cut true to standard gauge and each fitting recessed.



Malleable Fittings



"Excelsior" Valves
Brass—High Pressure

MALLEABLE FITTINGS

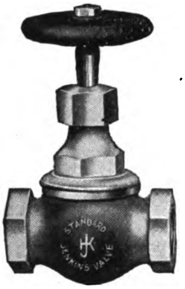
All styles—for all pressures. Plain, beaded or flat band.

BRASS FITTINGS

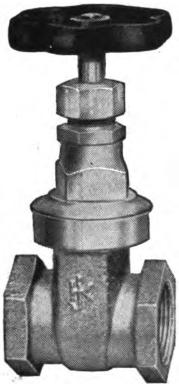
Screwed or flanged, rough or finished—standard or extra heavy.

DRAINAGE FITTINGS

Our line of special recessed fittings for wrought iron drainage systems has been in satisfactory use for years.



Jenkins Disc Brass Valves



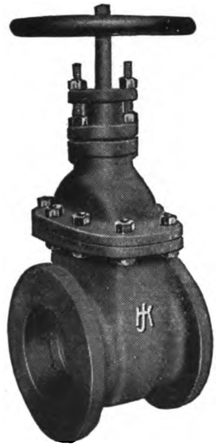
Brass Wedge Gate Valves

BRASS VALVES

We make a brass valve for every purpose and each valve a perfect product. Only the best grades of raw material used and each valve thoroughly tested to pressure recommended.

IRON BODY VALVES

Our line of iron body valves is most complete. We make every style and for all pressures.



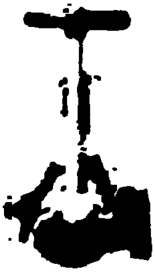
Iron Body Wedge Gate Valves

JENKINS BROS.

[illegible] YORK
[illegible] PHILADELPHIA
524 ATLANTIC AVE., BOSTON
300 W. LAKE ST., CHICAGO

[illegible]NKINS BROS., LIMITED
[illegible] 95 Queen Victoria St., London, E. C.
[illegible] RUBBER CO., ELIZABETH, N. J.

MANUFACTURERS OF JENKINS BROS. VALVES
[illegible] AND OTHER MECHANICAL RUBBER GOODS



JENKINS BROS. BRASS VALVES

[illegible] Bros. Brass Valves, Standard Pattern, are made in [illegible], cross, check, safety, Y and radiator patterns. [illegible] the original renewable disc valves.

[illegible] Discs, with which they are fitted, are of special [illegible], readily adapting themselves to the raised [illegible] tight closure. As there is no metal- [illegible] contact of seats, there is less abrasion and wear, [illegible] of regrinding is obviated. Jenkins Discs are in- [illegible] long service, and when worn out can be readily [illegible] removal of valves from piping. As regularly [illegible] are fitted with discs of hard composition for [illegible] or cold water, air or gas, discs of softer com- [illegible] recommended. The valves are guaranteed for work- [illegible] up to 150 pounds.

[illegible] BROS. IRON BODY VALVES

[illegible] Valves, Standard Pattern, are [illegible], check, Y, safety and back pres- [illegible] and strong. The working [illegible] to the standard pattern [illegible] fitted with Jenkins [illegible] raised seat, are inter- [illegible] Guaranteed for working steam [illegible]

Fig. [illegible]
Sectional view of
Iron Body Globe Valve
Extra Heavy Pattern

[illegible] BROS. EXTRA HEAVY VALVES

[illegible] Extra Heavy Valves are de- [illegible] pounds working pressure. [illegible], Angle and "Y" or Blow-off [illegible] in brass, either screwed or [illegible] to 3 inches, and iron body [illegible]. The valves are well [illegible] the very best steam metals, [illegible] with the workmanship. [illegible] and have powerful Acme standard threads. [illegible] are also large and arranged so that they can be [illegible] open. They are fitted with renewable steam [illegible] Jenkins Discs for cold water service, and also [illegible] be reground or renewed when necessary. [illegible], Angle and Swing Check Valves is also [illegible] be recommended as being fully adapted

[illegible] Heavy Valves are tested to 800 pounds [illegible] is so high, however, that the [illegible] this figure if required and [illegible] or air pressures up to

JENKINS BROS.

JENKINS BROS. EXTRA HEAVY AUTOMATIC EQUALIZING STOP AND CHECK VALVES

are designed to shut off, automatically, the flow of steam from the header to a boiler in case a tube should burst or other internal rupture occur, thereby suddenly reducing the pressure in the boiler. They also serve to equalize the pressure in a battery of boilers and prevent one boiler from working at a lower pressure than the others. As the valves can only be opened by the pressure in the boiler it is impossible to turn steam accidentally into a boiler which is being cleaned. To prevent chattering, the valve is cushioned by an internal dashpot made of bronze which eliminates all danger of sticking through corrosion.

Each valve is carefully tested to 800 pounds hydraulic pressure and is guaranteed for working steam pressures up to 250 pounds. The stuffing-boxes can be packed when valve is wide open under full pressure.

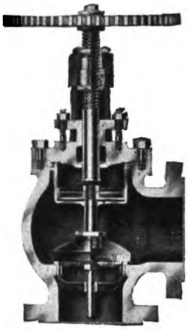


Fig. 293
Sectional View of Automatic Stop and Check Valve, Angle Pattern

JENKINS BROS. GATE VALVES

are a comparatively new, and distinctly high grade line. They are made in brass or iron body in three distinct patterns: Standard, for 125 pounds working steam pressure, or 175 pounds water; Medium, for 175 pounds steam or 250 pounds water; Extra Heavy, for 250 pounds steam or 400 pounds water.

They are all of the solid-wedge, double-face type. The wedge or gate is guided by ribs cast on the inside of the body, which fit in corresponding channels in the wedges, thereby preventing the wedge from dragging across the seat, preventing uneven wear on the faces, or chattering when valve is partly open.

One of the important features of these valves is the improved globe shaped body, a novel design which is used because it secures the greatest possible strength, good proportion and neat appearance.

The brass valves are regularly made in sizes ¼ to 3 inches. Larger sizes in brass can be made from iron body patterns.

Standard Iron Body Valves made in sizes 2 to 30 inches; Medium up to 18 inches; Extra Heavy up to 24 inches.

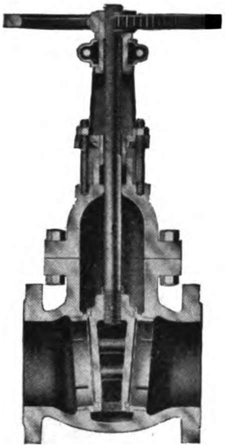


Fig. 245
Sectional View of Extra Heavy Iron Body Gate with Outside Screw and Yoke

JENKINS BROS. CAST STEEL VALVES

are made in Globe, Angle, Gate and Check Patterns, which experience has shown are perfectly adapted for the severe conditions incident to high pressure superheated steam service. The steel used in these valves is made in a modern converter from selected irons and for strength, ductility and soundness the castings are fully equal to those produced commercially by any known process.

For seat-rings, discs, bushings, and spindles Monel Metal is used, a natural alloy containing about 70 per cent nickel. The tensile strength is high, it is very hard, durable and non-corrosive and expands and contracts practically the same as cast steel. Seat-rings made of this metal do not get loose under the most severe conditions.

The valves are suitable for working steam pressures up to 350 pounds, and total temperature of 800° F.

All the genuine Jenkins Bros. Valves bear the Diamond Trade Mark, and are absolutely guaranteed to be perfect in workmanship and suitable and efficient in the service for which they are designed.

A catalogue of all the Jenkins Bros. products, giving sizes, styles and list prices mailed on request.

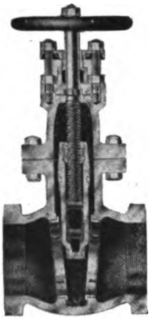


Fig. 250
Sectional View of Iron Body Gate, Inside Screw

THE LUDLOW VALVE MFG. CO.

[illegible]

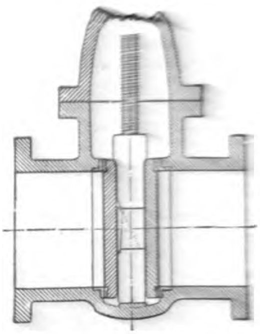
BRANCH OFFICES

NEW YORK: 63 Gold St.
BOSTON, MASS.: [illegible] Bldg.
PITTSBURGH, PA.: [illegible] Bldg.
CHICAGO, ILL.: [illegible]
PHILADELPHIA, PA.: [illegible] Bldg.
KANSAS CITY, MO.: [illegible] Bldg.

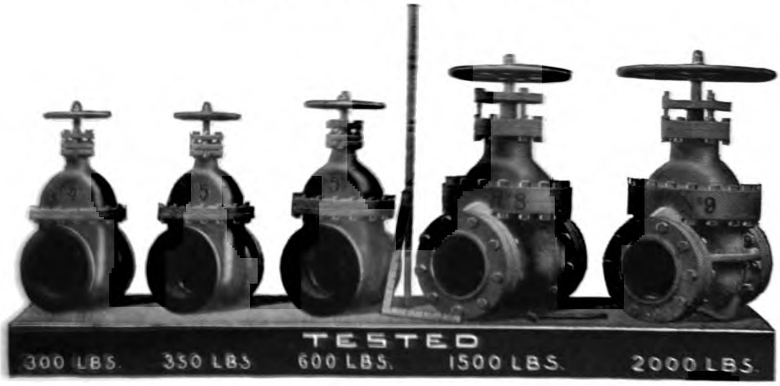
HIGH GRADE VALVES FOR EVERY PURPOSE: VALVES FOR STEAM, WATER, OIL, GAS AND AMMONIA, OF ANY SIZE AND FOR ALL PRESSURES: AUTOMATIC AIR VALVES AND FLOAT VALVES: RELIEF VALVES: SLUICE GATES: CHECK AND FOOT VALVES: COMBINATION AIR VALVE WITH CONTROLLING GATE: HYDRANTS.

THE LUDLOW DOUBLE GATE VALVE

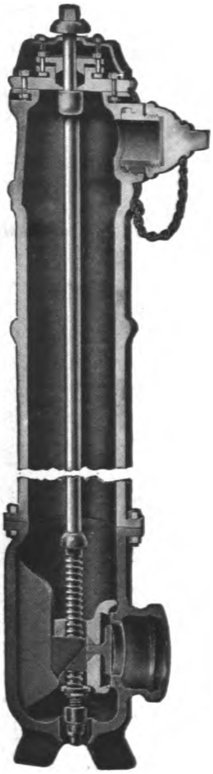
The illustrations [illegible] view of the Gates and Wedges. [illegible] closing them directly opposite the ports [illegible] avoiding wear on seats, [illegible] impossible. Stem cannot [illegible] cause stripping of threads on stem.



LUDLOW DOUBLE GATE VALVES FOR ALL PRESSURES
These Valves all have a [illegible] opening



THE LUDLOW VALVE MFG. CO.



FIRE HYDRANTS

Genuine Ludlow Slide Gate, Frost Proof, Fire Hydrant. Rubber-faced Gate. Bronze Mounted.

(a) Simple in construction.

(b) Drip valve in extreme bottom of hydrant, draining hydrant barrel completely and permitting no water to remain in same.

(c) All working parts can be removed without disturbing hydrant barrel or doing any digging.

(d) Gate is released from seat before starting to rise, avoiding wear on gate rubber.

(e) Gate when shut remains tight when top of hydrant is removed.

(f) No flooding of street in case standpipe or barrel is broken.

(g) In opening hydrant, first turn of the stem closes the drip valve, after which the bronze wedge nut in back of gate is loosened, relieving gate from its seat.

Final turn of the stem after gate is closed and wedged opens the drip valve.

(h) Frost case unnecessary.

(i) Large waterway.

From Page 110 Ludlow Catalogue, 1910

Size of Hydrant or Diameter Valve Opening	2″	3″	4″	4½″	5″	6″	8″
Inside diam. of Stand Pipe	3″	4⅝″	5¾″	6¼″	7″	8″	10″
Size Bottom Connection	2″	3″ or 4″	4″ or 6″	6″	6″ or 8″	6″ or 8″	8″ or 10″
Number and Size Nozzles	1-2″	1-2½″	2-2½″	3-2½″	3-2½″	4-2½″	6-2½″

Steamer nozzle can be added on sizes 4″ and up, or can be substituted for 2½″ nozzles. Inside independent cut-off gate can be furnished on 2½″ nozzles if wanted.

THE LUNKENHEIMER COMPANY

CINCINNATI, OHIO

BRASS, IRON, SEMI AND CAST STEEL VALVES, WHISTLES, COCKS, GAUGES, INJECTORS, LUBRICATORS, OIL PUMPS, OIL AND GREASE CUPS, MOTOR ACCESSORIES, ETC.

LUNKENHEIMER CATALOGUE

[illegible] following pages only a [illegible] the [illegible] considerably con- [illegible] for a complete description. [illegible] together with a [illegible] numbers. Reference must be [illegible] free of charge. [illegible] machinery [illegible] and [illegible] the entire line of [illegible] high grade en- [illegible] these appliances is [illegible]

[illegible] information of great [illegible] that has no [illegible]

LUNKENHEIMER [illegible] VALVES

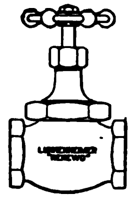
[illegible] Pattern [illegible] Large [illegible] pounds. [illegible] inches. [illegible]

[illegible] with- [illegible] them [illegible]

[illegible]

THE LUNKENHEIMER COMPANY

LUNKENHEIMER BRASS "RENEWO" VALVES



Globe, Angle and Cross Patterns; Screw of Flange Ends; Medium weight, for working pressures up to 200 pounds, Extra Heavy for 300 pounds; sizes from ¼ to 3 inches inclusive.

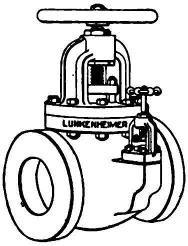
All parts are renewable, including the seat and disc, and the seating faces are also regrindable. Both seat and disc are made of a most durable nickel alloy, and their unique construction reduces the wear on the seating faces, caused by the great velocity of the steam flowing through the valve, makes them self-cleansing and eliminates water-hammer.

Areas through the bodies are larger than those of the connecting pipes; stuffing-boxes can be packed under pressure when the valves are wide open, and the valves are provided with a non-corrosive union connection between the body and hub.

LEADING DIMENSIONS

Size of valve	inches	¼	⅜	½	¾	1	1¼	1½	2	2½	3
Face to Face Screw End Globe Valves	Medium, inches	2 3/32	2 9/32	2⅝	3 7/32	3¾	4¼	4¾	5¾	6 13/16	7¾
	Ex Hy., inches	2 5/16	2 15/32	2⅞	3 17/32	4⅛	4 23/32	5¼	6⅜	7⅜	8⅜
Center of Port to Face of Screw End Angle Valves	Medium, inches	1	1 1/16	1¼	1 15/32	1 11/16	1 15/16	2 3/16	2⅝	3 5/16	3 13/16
	Ex Hy., inches	1 3/32	1 5/32	1⅜	1⅝	1 29/32	2 7/32	2 7/16	3	3 19/32	4⅛
Center of Port to Face of Screw End Cross Valves	Medium, inches	1	1 1/16	1¼	1 15/32	1 11/16	1 15/16	2 3/16	2⅝	3 9/16	4 1/16
	Ex Hy., inches	1 3/32	1 5/32	1⅜	1⅝	1 29/32	2 7/32	2 7/16	3⅜	3 13/16	4 5/16
Face to Face Flange End Globe Valves	Medium, inches	...	3	3 7/16	4	4 9/16	5 1/16	6⅛	7¼	8	9
	Ex Hy., inches	...	3¼	3 11/16	4⅜	5 1/16	5 9/16	6 13/16	8	9	10
Center of Port to Face of Flange End Angle or Cross Valves	Medium, inches	...	1 21/32	1 31/32	2¼	2 17/32	2 1/16	3 3/32	3⅝	4 3/16	4½
	Ex Hy., inches	...	1 23/32	2 1/32	2 5/16	2⅝	2 29/32	3 13/32	4	4½	5
Center of Port to Top of Stem, when open	Medium, inches	3⅞	3⅞	4 5/16	5 13/16	6 5/16	7	7⅝	8 11/16	9⅞	10 15/16
	Ex. Hy., inches	4 5/16	4 5/16	4¾	5 29/32	6¾	7⅝	8 11/32	9 17/32	11 1/16	12½

LUNKENHEIMER IRON BODY BRASS MOUNTED; "PUDDLED" SEMI-STEEL AND CAST STEEL GLOBE, ANGLE AND CROSS VALVES



Iron Body Brass Mounted—Medium Pattern, for working pressures up to 125 pounds, Heavy for 175 pounds and Extra Heavy for 250 pounds; Screw or Flange Ends. Extra Heavy Pattern can be had with or without interior or exterior by-pass. Medium and Heavy Patterns made in sizes from 2 to 12 inches inclusive; Extra Heavy without by-pass, from 2 to 10 inches, and with by-pass, from 3½ to 12 inches inclusive.

All parts subjected to wear are renewable; the seating faces of both the main and by-pass valves are regrindable, and the stuffing-boxes can be packed under pressure when valves are wide open.

For superheated steam, these valves can be had made of "Puddled" Semi-steel, a material having a tensile strength of 35,000 pounds per square inch; and for extreme conditions of pressure, superheat and strain, of cast Steel, the tensile strength of which is about 80,000 pounds per square inch.

LEADING DIMENSIONS OF IRON BODY AND "PUDDLED" SEMI-STEEL VALVES

Size of Valve	inches	2	2½	3	3½	4	4½	5	6	7	8	10	12
Face to Face Screw End Globe Valves	Med & Hy., in.	6 1/16	7 3/16	8 1/16	9	10	11⅛	12	13½	15¾	18	23¼	27
	Ex Hy., inches	8 3/16	10⅝	11¾	12¾	13	14	14⅞	16½	18¼	20	23¼	27¾
Center of Port to Face of Screw End Angle or Cross Valves	Med & Hy., in.	3 1/16	3 19/32	4 1/16	4½	5	5 9/16	6	6¾	7⅞	8⅝	10	11⅞
	Ex Hy., inches	4 3/32	5⅜	5⅞	6⅜	6½	7	7½	8¼	9⅛	10	11⅝	13⅞
Face to Face of Flange End Globe Valves	Medium, inches	7½	8½	9¼	10¼	11	12	12¾	14⅛	16⅛	19¼	24¼	27½
	Heavy, inches	8	9⅛	10	11	11⅝	12¾	13⅝	15	17	20¼	24¼	27½
	Ex. Hy., inches	9¾	11½	12½	13½	14	15	15¾	17½	19¼	21¾	25⅜	28⅝
Center to Face of Flange End Angle or Cross Valves	Medium, inches	3¾	4¼	4⅝	5⅛	5½	6	6⅜	7 1/16	8 1/16	8¾	10⅛	12
	Heavy, inches	4⅜	5	5⅝	6 1/16	6⅝	6 15/16	7¼	8 1/16	9	9⅝	11¼	12¾
	Ex Hy., inches	4⅞	5¾	6¼	6¾	7	7½	7⅞	8¾	9⅝	10½	12¼	14
Center of Port to Top of Stem, when open	Medium, inches	9¼	10⅝	11½	13¼	14⅝	15⅝	17	18⅝	20¼	22½	26⅞	30½
	Heavy, inches	9¼	10⅝	11½	13¼	14⅝	15⅝	17	18⅝	20¼	22½	26⅞	30½
	Ex Hy., inches	13¼	14¾	16⅜	17¾	19½	20½	22	24	27¼	29⅞	35⅞	40½
Center of Valve to End of By-pass, Extra Heavy Pattern	inches	...	...	...	7⅛	7¾	8	9¾	10⅞	11⅞	13⅛	16	17¾

(See also next page)

Continued from preceding pages

THE LUNKENHEIMER COMPANY

CINCINNATI, OHIO

LUNKENHEIMER IRON BODY BRASS MOUNTED, "PUDDLED" SEMI-STEEL AND CAST STEEL "VICTOR" GATE VALVES

Made with either stationary stem, inside screw, or rising stem and yoke, with or without by-pass, screw or flange ends.

Iron Body Brass Mounted—Standard Pattern, sizes 2 to 24 inches. From 2 to 8 inches inclusive for working pressures below 125 pounds, above 8 inches for pressures up to 100 pounds. Medium Pattern for working pressures up to 125 pounds, without by-pass in sizes 2 to 24 inches, with by-pass 3 to 24 inches. Heavy Pattern for 175 pounds working pressure; without by-pass, sizes 2 to 24 inches, with by-pass 3 to 24 inches. Extra Heavy Pattern for pressures up to 250 pounds; without by-pass, sizes 2 to 20 inches, with by-pass 3 to 20 inches.

All parts subjected to wear are renewable, and this includes the seats and discs. The valves are double-seated and will therefore take pressure from either end; both the main and by-pass valves can be packed under pressure when the valves are wide open, and the by-pass seating faces can be reground.

For superheated steam, the "Victor" Gate Valves are made of "Puddled" Semi-Steel, and for extreme conditions of pressure, superheat and strain, they are made of Cast Steel.

LEADING DIMENSIONS OF IRON BODY BRASS MOUNTED AND "PUDDLED" SEMI-STEEL VALVES

Size of Valve	Inches	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Standard	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Face to Face, Screw Ends	Med. & H.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Ex. Heavy	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Standard	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Face to Face, Flange Ends	Medium	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Heavy	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Ex. Heavy	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Center of Pipe to Top of Stem, Stationary Stem Pattern	Standard	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Med. & H.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Ex. Heavy	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Center of Pipe to Top of Stem, with Valve Open, Rising Stem and Yoke Pattern	Standard	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Med. & H.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Ex. Heavy	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Heavy	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Ex. Heavy	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Size of Valve	Inches	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	20	22	24
	Standard	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Face to Face, Screw Ends	Med. & Hy.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Ex. Heavy	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Standard	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	17	18	19
Face to Face, Flange Ends	Medium	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	24	25	26
	Heavy	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Ex. Heavy	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Standard	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	59
	Med. & Hy.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Ex. Heavy	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Standard	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Med. & Hy.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	101
	Ex. Heavy	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	Med. & Hy.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Ex. Heavy	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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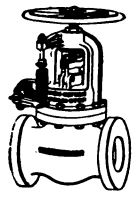
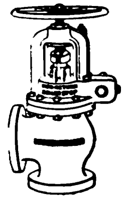
THE LUNKENHEIMER COMPANY

CINCINNATI, OHIO





LUNKENHEIMER NON-RETURN SAFETY BOILER STOP VALVES

Iron Body Brass Mounted; "Puddled" Semi-steel and Cast Steel

Made in sizes from 4 to 10 inches inclusive, screw or flange ends, and in five different combinations of material to suit the requirements of various conditions of superheat and high pressure, and to meet the specifications of engineers who may differ as to what is best suited to the purpose.

Valves will immediately close in case of a sudden decrease in pressure on the boiler side of the disc, caused by the blowing out of a tube in the boiler or any rupture of the headers, shell, etc. Chattering or vibration of the disc is overcome by an ingenious outside spring arrangement. Valves cannot be opened by hand, but can be positively closed.

Of extra heavy construction, well made in every detail, and guaranteed in every particular. All parts subjected to wear are renewable.

LEADING DIMENSIONS

Size of Valve.....inches	4	4½	5	6	7	8	10
Face to Face, Screw End Globe Valve.....inches	13	14	14⅞	16½	18¼	20	23¼
Center to Face, Screw End Angle Valve.....inches	6½	7	7½	8¼	9⅛	10	11⅝
Face to Face, Flange End Globe Valve.....inches	14	15	15¾	17½	19¼	21¾	25¾
Center to Face, Flange End Angle Valve.....inches	7	7½	7⅞	8¾	9⅝	10½	12¼
Center of Body to Top of Stem, open..... Globe Valve..inches	21¼	23	25	27	31¾	33½	40¾
Center of Body to Top of Stem, open..... Angle Valve..inches	21	22¾	24¾	27	31	33	39½
Center of Body to Extreme End of Yoke.....inches	9	9½	9⅞	11	12⅜	14	16½

LUNKENHEIMER "PUDDLED" SEMI-STEEL VALVES

Particularly adapted for high pressures and superheated steam.

The "Puddled" Semi-steel as used in Lunkenheimer valves is an extremely high-grade iron and steel alloy of very close grain and great strength, the tensile strength per square inch being about 35,000 pounds.

All parts subjected to wear are renewable, making the valves practically indestructible.

The line includes Globe, Angle, Cross, Gate, Check and Non-return Safety Boiler Stop Valves, guaranteed for working pressures up to 250 pounds per square inch, and to suit various conditions of superheat and meet the specifications of engineers who differ as to the material used for the trimmings, "Lunkenheimer "Puddled" Semi-steel Valves are made in two combinations.

LUNKENHEIMER CAST STEEL VALVES

For extreme conditions of pressure, superheat and strain, Lunkenheimer Cast Steel Valves are unexcelled.

They are the only cast steel valves made to meet standard specifications and are the only steel valves containing less than .05 per cent of either phosphorus or sulphur.

The tensile strength of Lunkenheimer Cast Steel is about 80,000 pounds p square inch, with a safe elastic limit and excellent elongation.

To suit the requirements of various conditions of superheat and high pre and also to meet the specifications of engineers who may differ as to wl best suited to the purpose, Lunkenheimer Cast Steel Valves are made i combinations as regards the material used for the trimmings.

The line includes Globe, Angle, Gate, Non-return Safety Boiler Stop Valve

(See also next page)

THE LUNKENHE

CINCINNA

BRASS, IRON, SEMI AND CAST ST
GAUGES, INJECTORS, LUBRICATOR
CUPS, MOTOR ACCESSORIES, ETC.

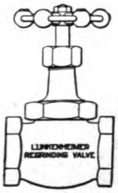
LUNKEN

We illustrate on thi few of our leading speci densed, owing to the la with sectional illustra large number of other had to our Catalogue,

This book consist illustrated, and sho **Lunkenheimer products, which is n gineering specialties in the world by far the greatest.**

The Lunkenheimer Catalogue a value and of daily use to engine engineer can afford to be without.

LUNK



Made in Glo Ends; Medium Extra Heavy inclusive.

These valv out removin as tight as able; the s the valves are wide open; th inside diameter of the co body and hub provides a

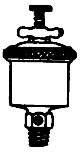
Size of Valve..........
Face to Face Screw End Globe Valve
Center to Face Screw End Angle or Cross Valves
Face to Face Flange End Globe valve........
Center to Face Flange End Angle or Cro Valve..........
Center of Port to Top Stem, when open

(Continued from preceding pages).

THE LUNKENHEIMER COMPANY

CINCINNATI, OHIO

LUNKENHEIMER "IDEAL" AUTOMATIC GREASE CUP

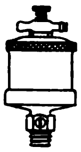


"Ideal"

This cup is heavy in design, elegantly finished and made of the highest grade of bronze composition. It is of the automatic compression type and can be depended upon to feed the quantity of grease for which it is set. The regulation of the feed is accomplished by means of a screw in the shank.

It is intended for use on engine crank pins, journals, etc. Made in seven (7) sizes, for capacities from 1/3 to 18 ounces.

LUNKENHEIMER "LION" AUTOMATIC GREASE CUP

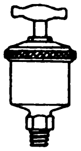


"Lion"

Intended for all kinds of machinery bearings. Automatically feeds any quantity of grease desired. The grease reservoir is removable, to facilitate the filling of the cup.

Made of bronze in seven sizes, capacities ranging from 1/3 to 18 ounces.

LUNKENHEIMER SCREW-FEED "MARINE" GREASE CUP

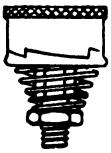


"Marine"

Intended for such purposes where grease is fed to bearings from a distance. Of heavy design and absolutely reliable.

Made of bronze in seven sizes, capacities ranging from 1/3 to 18 ounces.

LUNKENHEIMER "LOCK" GREASE CUP

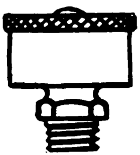


"Lock"

A screw compression cup with spring ratchet attachment, to prevent the cap from jarring off. Particularly adapted to all machinery subjected to excessive vibration. Made of a high grade bronze composition and exceptionally strong and durable.

Can be had in five sizes, for capacities ranging from 1/8 to 2 ounces.

LUNKENHEIMER "TIGER" PLAIN BRASS GREASE CUP



"Tiger"

This cup is of the plain screw compression type, equipped a spring lock, to prevent the cap from jarring off. They ar nished in three styles,—Finished Brass, Nickel Plated or R

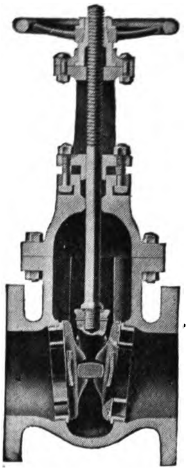
Made in seven styles, for capacities from 1/8 to 5 ou They are guaranteed to be absolutely reliable and made o highest grade of bronze composition.

NELSON VALVE COMPANY

CHESTNUT HILL, PHILADELPHIA

Branches in all Principal Cities.

MANUFACTURERS OF HIGH GRADE BRONZE, IRON AND STEEL VALVES OF EVERY KIND FOR EVERY PURPOSE



THREE WORKING PARTS KEEP NELSON GATE VALVES TIGHT

Two self-adjusting discs and one central wedge form the simple mechanism upon which rests the success of NELSON Double-Disc Gate Valves—the one element of design that merits the serious consideration of all who want a valve that stays tight under all conditions.

THE DISCS

Two one-piece, cast-iron discs, faced with bronze disc-rings rolled-in, insure tight seating. Four lugs are cast on each disc, which interlock, enclosing a corresponding shoulder on the central wedge.

THE WEDGE

The bronze stem screws into a bronze nut which is cast inside of the iron wedge. When the valve-stem is raised, the shoulders on the wedge press upon the upper disc-lugs, unseating the discs and opening the valve; in closing, the process is of course reversed, the lower disc-lugs receiving the downward pressure of the central wedge.

ROCKING DISCS NATURALLY FIND TRUE ANGLE OF SEATS

With the NELSON Gate Valves, the discs are loose on the central wedge, so that no matter how the valve-body may be distorted, they will assume the angle of the seats, making a perfectly tight shut-off. Two guides cast on each disc fit into grooves in the valve-body, eliminating chattering, avoiding scraping or scoring of discs or seats, and assuring easy travel until valve is completely closed.

BRIEF LIST OF NELSON VALVES

Bronze:	Angle and Globe, of all kinds, for all purposes; Gate Valves; Check Valves of every type.
Iron Body:	Gate Valves; Hydraulically Operated Valves; Electrically Operated Valves; Globe and Angle Valves; Throttle Valves; Cushioned Non-Return Stop and Check Valves; Cushioned Non-Return and Swing Check Valves.
Steel:	Gate Valves; Globe Valves; Throttle Valves; Cushioned Non-Return Stop and Check Valves; Cushioned Non-Return Valves; Swing Check Valves.

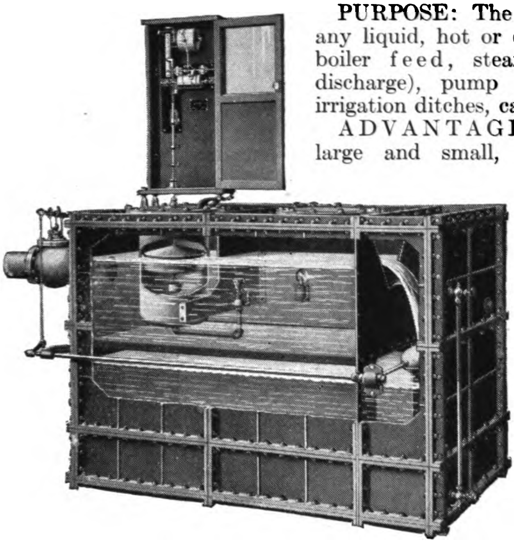
Complete catalog describing *all* NELSON VALVES sent immediately upon request.

YARNALL-WARING COMPANY

CHESTNUT HILL, PHILADELPHIA

SOLE MANUFACTURERS IN THE UNITED STATES OF THE "LEA" V-NOTCH RECORDING METER; SIMPLEX SEATLESS BLOW-OFF VALVE AND THE SIMPLEX PIPE JOINT CLAMP.

"LEA" V-NOTCH RECORDING METER



New Extra Storage Type "Lea" V-Notch Recording Meter.
It will straighten out your feed curve.

PURPOSE: The accurate measurement of any liquid, hot or cold. Is used for measuring boiler feed, steam consumption (condenser discharge), pump discharge, acids, streams, irrigation ditches, canals, sewage, etc.

ADVANTAGES: At all rates of flow, large and small, the greatest advantage of the "Lea" V-Notch Meter is that it is dependably accurate, as it depends only upon water falling by the simple law of gravity unassisted by any mechanical means, through a V-Notch weir, the quantity of which for each inch of head every engineer knows.

(Thompson's formula — Quantity equals constant × H).

Read these other advantages:

1st. Records the flow for each moment continuously.

2d. No extra storage space for hot water required as flow is continuous.

3d. Guaranteed accuracy within 1½%.

4th. Equally accurate for maximum or minimum flow.

5th. Accuracy unaffected by irregular velocity, temperature changes, dirt, scale or sediment. No moving parts in path of flow to get out of order.

6th. No parts of the recording instrument exposed to the flow of liquid being measured.

7th. "Lea" Recorder is inexpensive in first cost, has no after-expense for upkeep, and saves more than enough to quickly pay for itself.

8th. Your safest guarantee is the success of the "Lea." There are now nearly 600 in use, measuring over half a million engine and boiler horse-power.

Write for bulletin.

SIMPLEX SEATLESS BLOW-OFF VALVE

Nearly 5000 in Use.

1st. Has no seat to leak. 2d. Automatically packed. 3d. Packing is alwa protected.

SIMPLEX PIPE JOINT CLAMP

Over 8000 in Use.

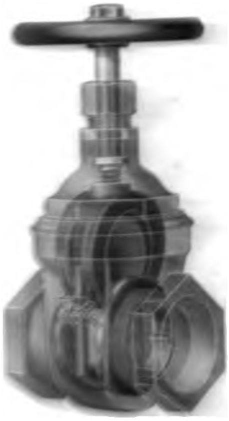
Stops any pipe joint leak immediately.
Write for complete bulletins about all these.

THE PRATT AND CA[illegible]

HARTFOR[illegible]

VALVES FOR ALL [illegible]

[illegible]



With [illegible] retaining [illegible]. Screw [illegible] Construction.

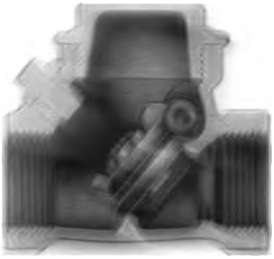
The seat rings [illegible] or any special [illegible] service in wh[illegible] a double faced [illegible] grooves [illegible] the valve body.

Great pains are [illegible] parts of these gate valves [illegible] each part to insure their accuracy and interchangeability.

The guides in our bodies are [illegible] thickness, and the wedge can be taken out of the valve and replaced with the [illegible] will give an accurate fit. The importance [illegible] making repairs is obvious. These valves being double seated, can be used with the pressure applied at either end.

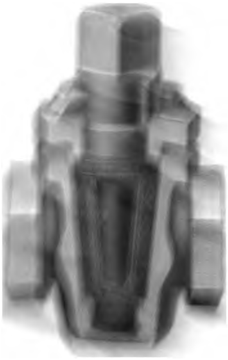
REGRINDING SWING CHECK VALVES

Brass and Iron



[illegible] for all pressures, sizes up to [illegible] combines pressure [illegible] Material [illegible] We [illegible] workmanship.—Each valve [illegible] to the pressure stated [illegible] ground. Assembling [illegible] hands. The [illegible] replacement of any working [illegible] valve from line. [illegible] but a wrench and [illegible]

ASBESTOS-PACKED COCKS



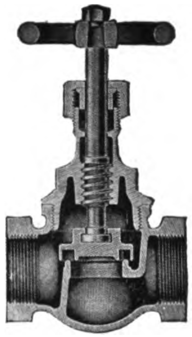
[illegible] shaped grooves in the [illegible] asbestos. [illegible] standard [illegible] The gland [illegible] extraordinary [illegible] and a [illegible]

THE PRATT AND CADY COMPANY

HARTFORD, CONN.

VALVES FOR ALL PURPOSES

ASBESTOS DISC VALVES



The Stuffing Box Gland is long, heavy and well fitted.

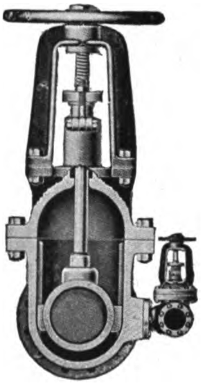
The Spindle Collar, and its point of contact with the bonnet, have specially smooth surfaces and make a steam-tight joint when valve is fully open.

The Disc Holder is guided by four splines in the body, assuring perfect alignment at all times. The Disc Holder is of the horseshoe type, and can be removed and replaced, the only tool necessary therefor being a wrench to unscrew the bonnet.

The Seat is spherical, thus preventing the settling thereon of any substance that might hold the disc from going squarely to its place. The metal used in the construction of these valves is approximately 86% pure copper. We use no scrap whatever in the construction.

The Valve complete is finished with the utmost care. When so ordered, these valves can be made with solid brass disc, or with brass disc holder filled with special metal, at additional price.

CAST STEEL GATE VALVES FOR SUPER-HEATED STEAM



All Valves 2½" and larger are equipped with Cast Steel Bodies, Bonnets and Wedges.

The Seats and Faces of the Wedges are made of Nickel, securely fastened in place so that they will be unable to work loose.

Stems are Nickel Steel.

All Bolt Holes are Spot Faced.

Bonnet Joint is packed with the best grade of Super-heat Packing.

The End Flanges have $\frac{1}{16}$" Raised Faces, extending full width inside of Bolt Holes, with smooth finish.

All Bolts have Hexagon Heads and Nuts, with the under side of same semi-finished.

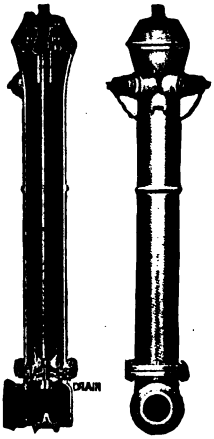
The Discs are of the Wedge Pattern.

Stuffing Box is made with Hinge Bolts, very deep for square Packing.

Yoke is bolted to the Bonnet.

All tested to a hydrostatic pressure of 800 lbs.

COMPRESSION TYPE HYDRANTS



Without Intricacy of Construction.

Complete catalog of all Pratt and Cady products on request.

PITTSBURGH VALVE FOUNDRY & CONSTRUCTION CO.

PITTSBURGH, PA.

[illegible]

ENGINEERS, MANUFACTURERS AND ERECTORS

Designers and Builders of Valves, Fittings and Appliances of Every Description for Steam, Gas, Water, Air and Hydraulic Piping.

Designs and Estimates for special valves and equipment furnished upon receipt of specifications.

[illegible]

[illegible] Double Spindle Gate Valve

[illegible] Butterfly Valve

Hand Operated Gate Valves.
Electrically Operated Gate Valves.
Cylinder Operated Gate Valves.
Quick Opening Gate Valves.
Globe, Angle and Cross Valves.
Check Valves.
Butterfly Valves.
Electrically Operating Valves.
Cylinder Operating Valves.
Water Operating Valves.
Relief Valves.
Back Pressure Valves.
Non Return Valves.
Throttle Valves.
Transfer Valves.
Register Valves.
Float Valves.
Foot Valves with Strainers.
Blow Off Valves.
Plug Valves.
Hydraulic Cocks.
Tuyere Cocks.
Hydraulic Spring Cushions.
Gas Line Materials.
Pressure Regulating Stations.
Cast Iron Pipe.
Pipe Fittings and Flanges.
Pipe Bends.
Expansion Joints.
Exhaust Heads.
Steam Separators.
Drip Pockets.
Strainers.

PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO.

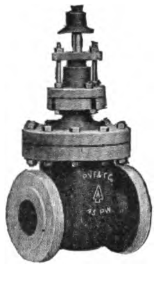
PITTSBURGH, PA.

GATE VALVES

SPECIFICATIONS FOR MATERIAL	Grey Iron—22,000 lb. per sq. in. tensile strength. Semi Steel—33,000 lb. per sq. in. tensile strength.
PARALLEL SEAT 50 lb. WORKING PRESSURE 100 lb. TEST PRESSURE	Sizes 14" to 72" cast iron. Low pressure. For water, gas, air or exhaust steam. Extremely close face to face, invaluable in complicated piping connections.
PARALLEL SEAT 125 lb. WORKING PRESSURE 300 lb. TEST PRESSURE	Sizes 2" to 48" cast iron. Standard pressure. For water, air, steam or gas. Fully bronze mounted. Especially adapted to water distribution.
PARALLEL SEAT 200 lb. WORKING PRESSURE 400 lb. TEST PRESSURE	Sizes 1½" to 16" cast iron. Largely used for natural gas under the lower pressures. Furnished either all iron or iron body bronze mounted.
PARALLEL SEAT 400 lb. WORKING PRESSURE 800 lb. TEST PRESSURE	Sizes 3" to 20" semi steel. In extensive use for the transmission of natural gas. Furnished either with or without bronze mountings.
PARALLEL SEAT 500 lb. WORKING PRESSURE 1500 lb. TEST PRESSURE	Sizes 2" to 12". For water or oil at pressure noted. Semi steel with solid bronze mountings.
PARALLEL SEAT 1000 lb. WORKING PRESSURE 1500 lb. TEST PRESSURE	Sizes 2" to 12" semi steel. High pressure gas valve used chiefly at the gas wells and on feeders in the gas fields.
PARALLEL SEAT 1500 lb. WORKING PRESSURE 2000 lb. TEST PRESSURE	Sizes 2" to 10" semi steel. For hydraulic service and extreme natural gas rock pressures.
TAPER SEAT 175 lb. WORKING PRESSURE 500 lb. TEST PRESSURE	Sizes 2" to 16" semi steel. A valve for medium steam pressures from 125 lb. to 175 lb. where a less expensive valve than the 250 lb. type is desired.
TAPER SEAT 250 lb. WORKING PRESSURE 800 lb. TEST PRESSURE	Sizes 1½" to 28". Made of semi steel with solid bronze mountings for ordinary steam pressures or of cast steel with monel mountings for superheat.
TAPER SEAT 1000 lb. WORKING PRESSURE 2000 lb. TEST PRESSURE	Sizes 2" to 10". The strongest valve possible to make in its weight, all surfaces being cylindrical or spherical segments.
GATE VALVES FOR ANY PRESSURE	Designs and quotations furnished for valves for special conditions or higher pressures. Materials used are those best adapted to service.

50 lb. Parallel Seat Gate Valve. Close Pattern

8″ 500 lb. Gate Valve



4″ 1000 lb. Gas Line Gate Valve

8″ 1000 lb. Hydraulic Gate Valve

(See also next page)

645653

[illegible]

PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO.

PITTSBURGH, PA.

[illegible]

30" Gate Valve Operated by Air Cylinder

Any of the foregoing gate valves may be equipped with operating cylinders for any service or pressure, or motors for either direct or alternating current.

The following types of operating valves are extensively used for the control of motion of hydraulic cylinders either single or double acting.

[illegible]

The **CRITCHLOW VALVE** is the simplest form of hydraulic three or four way piston valve and has been designed for working pressures up to 500 pounds. It is durable and easy to repack. The CRITCHLOW [illegible] provides a means of grouping these valves which effects a great saving in pipe, fittings, manifolds and space where a number of cylinders are to be operated from one pulpit.

The **TANNER VALVE** is more satisfactory than the Critchlow for high pressures. It is of the cup-[illegible] type and is so designed that the fluid forces the [illegible] away from the ports instead of into [illegible] the packing and making [illegible]. The arrangement of supply and [illegible] facilitates attaching to manifolds. [illegible] can be furnished with actuating cylinders [illegible] remote control by means of a pilot [illegible]

The **AIKEN VALVE** has given complete satisfaction to a large number of users for many years. [illegible] and patterns for this valve have been [illegible] from the estate of Henry Aiken, M.E., [illegible] can be made to meet any require-[illegible]

[illegible] Special Cross with 30" Side Outlet

PITTSBURGH VALVE, FOUNDRY & CONSTRUCTION CO.

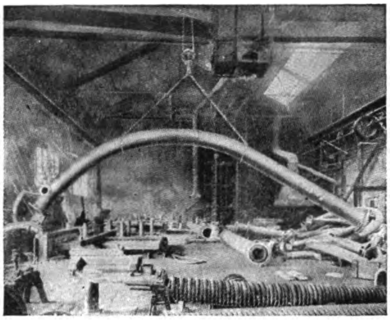
PITTSBURGH, PA.

PIPING SYSTEMS

For all Pressures and Purposes, Designed, Manufactured and Installed

Pipe Bending Pipe Cutting
Pipe Fitting

Estimates furnished on receipt of specifications

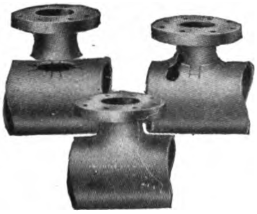


20" Expansion Bend—Radius 16 Ft.
This bend contains 38 ft. of pipe and was made of two lengths joined in the arc by the Atwood Line Weld

The Atwood Line Weld
Patented

THE ATWOOD LINE WELD

This method of joining the abutting ends of wrought pipe allows the fabrication of pipes into lengths as long as can be handled for shipment with consequent reduction by about 50 per cent of the number of flanged joints in the line.



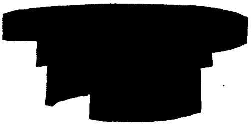
The Interlock Welded Neck
Patented

INTERLOCK WELDED NECKS

This method of connecting branch lines of wrought pipe to mains of the same material was developed in response to the demand of steam users for a structure containing the minimum number of joints. Every branch so connected eliminates a cast fitting with its attendant joints, gaskets and bolts and liability to trouble therefrom.

FLANGED JOINTS

Atwood, Screwed, Shrunk, Expanded and Welded.



The Atwood Joint

Trade Mark
ATWOOD

McNAB & HARLIN MFG. CO.

55 John Street, NEW YORK CITY

BRASS AND IRON GOODS: FITTINGS, VALVES, COCKS, PIPE, I
FOR STEAM, WATER AND GAS.

CAST IRON FITTINGS—SCREWED

"MH" Fittings are made of the best quality grey iron threaded to Briggs Standard Gauge. We have a comp line of patterns for all styles, in both Standard and E Heavy.

In addition to our full line of steam fittings, we hav complete line of patterns for Drainage Fittings, and L Turn Fittings particularly adapted to Sprinkler Work.

CAST IRON FITTINGS—FLANGED

We carry a very large and complete stock of both Standard and High-Pressure Flanged Fittings, in all styles and sizes, and are in a position to furnish these goods, which are designed for high grade power plant installation, on very short notice.

BRASS FITTINGS

"MH" Brass Fittings are made from a standard compo tion best suited for this class of work. Having a comple line of patterns for both Flanged and Screwed, we are in position to furnish these Fittings from the Malleable and t Cast Iron patterns very promptly.

STEAM METAL VALVES

Our line of patterns for Steam Metal Valves in the different styles, viz: Globe, Angle, Cross, Gate and Check, is very complete, and we are in a position to furnish these goods to stand all requirements, from the ordinary pressures to the extreme high pressures which we find are being used more extensively every day. We have just added to the extensive line of "MH" goods a complete line of patterns for "MH" Regrinding Valves. These Valves are made of the best quality steam metal, and are equal to any Regrinding Valve on the market.

IRON BODY VALVES

We manufacture a complete line of "MH" Iron Bo Valves in Globe, Angle, Cross, Gate and Check, bo Flanged and Screwed, Inside Screw and O. S. & Y. I keeping with our line of Brass Valves, we have a full l of patterns for these goods, both Standard and Exte Heavy, and recommend them to give perfect satisfact as the materials entering into their manufacture are of high grade, and the workmanship first class.

We are devoting special attention to Power Plant In stallation, and solicit your inquiries for the material re quired in this line of work.

For a complete description and dimensions of the fu line of "MH" goods, we refer you to our illustrated cata log, which can be obtained on application.

AMERICAN DISTRICT STEAM CO.

GENERAL OFFICES AND WORKS
NORTH TONAWANDA, N. Y.

First Nat. Bank Bldg.
CHICAGO

Hoge Building
SEATTLE

ENGINEERS AND CONTRACTORS; CENTRAL STATION HEATING; POWER, LIGHTING, RAILWAYS, GAS, WATER WORKS PLANS, SPECIFICATIONS, EXAMINATIONS AND REPORTS; MANUFACTURERS OF STEAM SPECIALTIES.

CENTRAL STATION HEATING SYSTEMS

UTILIZING THE EXHAUST STEAM FROM ELECTRIC LIGHT AND POWER PLANTS FOR HEATING STORES, OFFICES, PUBLIC BUILDINGS, SCHOOLS, CHURCHES, RESIDENCES, ETC.

Our extensive experience dating back to 1877, enables us to closely foretell the possible income from the utilization of exhaust steam, if used according to the plans of the American District Steam Heating System. Hundreds of Central Stations are now operating over 1000 miles of underground mains with our system. In many cases, they have found that the income from the installations of the American System is often more than enough to pay all the expenses of generating current. We gladly send our engineers to investigate conditions, estimate the cost and tell what results can be expected.

STEAM SPECIALTIES

The following list gives the range of our activity in the manufacture of steam specialties:—

Steam Pipe Casing
Single Expansion Variators
Double Expansion Variators
Standard Expansion Joints
Iron Body Expansion Joints, Single and Double
Flanged Anchor Specials
Special Flanged Fittings for Underground Steam Mains
Boosters
Standard Flanged Fittings
Extra Heavy Flanged Fittings
Reducing Companion Flanges
Companion Flanges
Long Sweep Cast Iron Fittings
Cast Iron Fittings
Galvanized C. I. Fittings
Extra Heavy C. I. Fittings
Branch Tees or Manifolds
"Adsco" Graduated Radiator Valves
" Damper Regulator and Relief Valve
"Adsco" Graduated Receivers
" Mercury Gauges
" Water Gauges
"Adsco" Water Heaters
Railing Fittings
Cast Iron Drainage Fittings
Pipe Saddles and Clamps
Steam Meters, "pressure"
Expansion Pipe Hangers
Pipe Hooks and Straps
Floor and Ceiling Plates
Floor Sleeves and Thimbles
Ball Joints
Adjustable Annular Wedges
Flanged 45° and 90° Angle Joints
Steam Traps, high and low pressure
Separators
Back Pressure Valves
Cast Iron Valve Curbs
Packingless Iron Body Gate Valves
Iron Body Gate Valves
Radiator Valves
Condensation Meters
High Pressure Piping
Reducing Valves
Special Pipe Cut to Order
Flanged Cast Iron Pipe
Wooden Water Pipe

Send to-day for our Bulletins and Catalogues—They are free and explain fully.

[illegible] DAVIS REGULATOR CO.

[illegible]

[illegible] VALVE SPECIALTIES: PRESSURE REDUCING [illegible] PRESSURE [illegible] EXHAUST RELIEF [illegible] PUMP GOVERNOR, [illegible] AND CHECK VALVES AND OTHER DEVICES.

DAVIS PRESSURE REGULATORS

[illegible] pressure up to [illegible]

[illegible] and [illegible] delivery [illegible] the [illegible] the [illegible] pressure [illegible] initial pressure. It [illegible]

[illegible] packing, [illegible] operation [illegible] weights which [illegible] adjust for any [illegible] automatic valve [illegible] pressure [illegible] engine, pump, heater, [illegible] system or wherever [illegible] attained.

[illegible] Regulator [illegible] where there is no [illegible] may be attached, [illegible] the body to receive [illegible] of steam at any delivery [illegible] air or water and those for a greater [illegible] pounds are constructed especially for the service.

[illegible] to prevent the lever from [illegible] Sizes [illegible] to 14 inches. [illegible] the only difference [illegible] well adapted to either high [illegible] 3″ to 10″ x 36″

[illegible] construction to No. 2 but has hub ends and [illegible] wooden or cast-iron water pipe for the [illegible] initial pressure up to 300 pounds maximum [illegible] Sizes 1½ to 14 inches.

[illegible] constructed for steamship service, being [illegible] sliding ball weight instead of scale weights. [illegible] valves should always specify both [illegible]

[illegible] BACK PRESSURE VALVE

[illegible] Engines only.

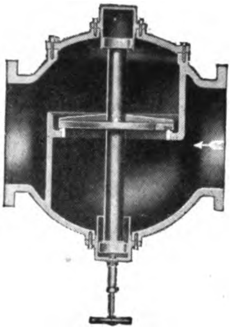
[illegible] pressure up to 25 pounds.

[illegible] Back Pressure Valves [illegible] pressure [illegible] purposes [illegible] operation [illegible] The [illegible] metals [illegible] This valve [illegible] vertical [illegible] 2 to 20 inches [illegible] have either [illegible] have flanged [illegible]

G. M. DAVIS REGULATOR CO.

DAVIS AUTOMATIC EXHAUST RELIEF VALVES

Suitable for exhaust steam at atmospheric pressure.



Flanged Ends
Horizontal Pattern

Davis Exhaust Relief Valves are designed for use with condensing engines to relieve direct to the atmosphere any pressure which may accumulate in the condenser, if for any reason the vacuum is lost. They have full pipe opening, and allow the steam to exhaust through them freely without choking. The valve seats are made from a bronze ring, and the discs are faced with a special babbitt metal, which construction enables them to hold tight under high vacuum and not adhere to each other when pressure comes on the valves. Sizes from 6" to 36" with standard flanged ends only.

Class A Valves are made in both horizontal and vertical patterns with water seals. The disc is cushioned by dash pots so it will not pound.

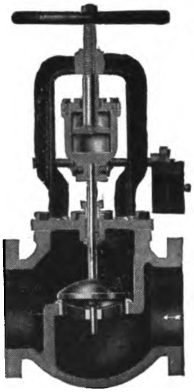
Class B Valves are made in the angle pattern only, with the inlet horizontal and the outlet vertical downward. This type is well adapted for use with vertical reciprocating or turbine engines in connection with jet or surface condensers.

Class C Valves are also made in angle pattern only, but have the inlet vertical and the outlet horizontal just the opposite to Class B. Used to good advantage where the piping comes close beneath the floor.

DAVIS AUTOMATIC STOP AND CHECK VALVES

Suitable for any working pressure up to 250 pounds.

The Davis Class A Automatic Non-Return Valve is placed between the boiler and the header and is designed to act instantly and cut out the disabled boiler from the battery in event of an internal accident to one of them. It also acts as an equalizing valve to insure each unit being kept up to the average pressure in the header.



Class C Type
Flanged Ends—Globe Pattern

Simplicity of construction is one of the valuable features of this valve. It has no internal dash pot to become corroded or coated with scale, and cause it to stick. Controlled entirely by the flow of steam, pressure not affecting its operation in any way. Made in sizes from 2" to 12", with extra heavy flanged ends for all sizes.

Class C Automatic Stop and Check Valve answers the same purpose as the Class A type, but is of entirely different design. Made with an oil dash pot, rigidly connected to the stem, which is located outside the valve body away from the action of the steam, and while it effectively cushions the disc it cannot possibly be the source of any trouble. This feature is a distinct improvement on any construction yet devised and insures a valve that is absolutely dependable regardless of operating conditions. Sizes from 2 to 12 inches.

Class CB Stop and Check Valve is a triple duty valve intended to be used on boilers in a battery in connection with an automatic pilot valve or three-way cock. In addition to protecting both the boiler and the steam-main this valve may be used as a positive shutoff valve. Made in sizes from 4 to 12 inches.

Our new Catalogue No. 8 fully describes the above and other Davis Valve Specialties and will be gladly forwarded upon request.

GOLDEN-ANDERSON VALVE SPECIALTY CO.

1218 FULTON BLDG. PITTSBURGH PA.

STEAM AND WATER SPECIALTIES

Triple Non-Return Valve

AUTOMATIC DOUBLE-CUSHIONED TRIPLE-ACTING NON-RETURN VALVES

(Angle or Globe)

"Works Both Ways;" automatically protects the boilers and steam lines.

They will prevent one boiler working at a lower pressure than another; also should a tube burst, they will instantly shut off the flow of steam from the other boilers into the injured boiler.

The Automatic Safety Stop Feature protects life and property in case a break or rupture occurs in the main steam line or branches. The valves will automatically cut off the flow of steam from the boilers until the break is repaired.

1128 of these were ordered by the U. S. Steel Corp. for the protection of their power plants.

Made in sizes 2 inches to 24 inches.

THE CONTROLLING ALTITUDE VALVES

These are intended for automatically maintaining uniform stage of water in tanks, standpipes or reservoirs and do away with the annoyance of floats or fixtures. They are especially adapted for water works and railroads.

These valves can be used with either high or low pressures and may be closed automatically by water, by electricity or by hand.

In addition to the type illustrated we build valves with electrical attachments that can be quickly closed by means of a direct or alternating current. The solenoids are attached directly to the valves and wired up to switch at pumping station or switches at various locations, thus permitting instant operation.

Altitude Valves are made in either the angle or globe pattern, in the following sizes: 3, 4, 6, 8, 10, 12, 14, 16, 18, 20 and 24 inches.

Controlling Altitude Valve

AUTOMATIC FLOAT VALVES

The Pat. Automatic Angle and Straightway Float Valves are also intended for controlling water levels in tanks, standpipes or reservoirs. They can be instantly adjusted to operate quickly or slowly.

When in operation, the water comes in under the valve or piston, also through port on top of valve. Owing to the greater area above the valve it is held closed. When lever is operated by float the auxiliary valve closes the inlet port and opens exhaust port.

Owing to the pressure on top of the valve being removed, the pressure under valve forces it open. The water above the valve acts as a cushion in opening, and as the valve travels upwards it draws in air through ports in the side of the body to cushion the valve when closing. Made in the following sizes, for either high or low pressures: 1, 1¼, 1½, 2, 2½, 3, 4, 5, 6, 8, 10, 12, 14, 16, 18, 20 and 24 inches.

Float Valve—angle or straight-way

FOSTER ENGINEERING CO.

NEWARK, N. J.

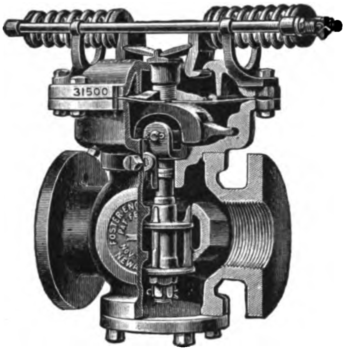
Branch Offices: CHICAGO PHILADELPHIA BOSTON PITTSBURGH

MANUFACTURING ENGINEERS OF AUTOMATIC VALVE SPECIALTIES

PRODUCTS

PRESSURE REGULATORS (Reducing Valves), PUMP GOVERNORS (different styles for different purposes), for steam, water, gas and air. HYDRAULIC REGULATING and RELIEF VALVES, for high and low pressures. Automatic FREE EXHAUST or RELIEF VALVES; BACK PRESSURE VALVES; FAN ENGINE REGULATORS, for controlling speed of fan by pressure in boiler. LEVER BALANCED VALVES; FLOAT VALVES, auxiliary-operated and direct-connected. AUTOMATIC NON-RETURN STOP VALVES; AUTOMATIC NON-RETURN EMERGENCY STOP VALVES, for saturated and superheated steam—semi-steel and cast steel bodies, and other kindred devices. Over 60 different styles. Also design valves for special services.

PRESSURE REGULATOR—CLASS "W"



For Maintaining a Constant Uniform Delivery Pressure from a Higher Initial Regardless of Variations in the Boiler Pressure or Source of Supply. For Service on Steam, Water, Gas and Air.

Its "compensating spring and toggle lever arrangement" makes it phenomenally sensitive, accurate and reliable. Has no weights, levers, or close-fitting piston or parts to cause friction. Very simple in construction and adjustment. Made in sizes ½-inch to 1-inch of composition; larger sizes, iron body, composition mounted. Sizes 2½-inch and up are fitted with *renewable seats*, forged steel stem and levers—insuring **durability** and **minimum repairs.** Thousands are in use today in all civilized countries and is the "standard" of many large power and manufacturing plants.

FOSTER CLASS "G" PRESSURE REGULATING VALVE

FOR INTERMITTENT SERVICE

A decided innovation, so extremely sensitive and withal so reliable that delivery pressure may be adjusted from zero to within a fraction of the initial pressure, and at point of adjustment the delivery will remain constant, regardless of variation in initial pressure or volume of discharge.

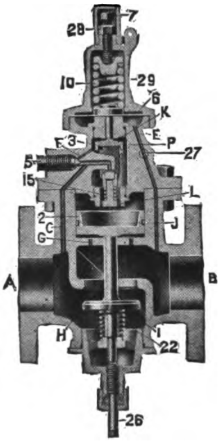
Will operate equally well on horizontal or vertical pipe; upright, inverted or inclined at any angle.

Although of wide range of operation, no part of this valve is of delicate construction or easily deranged.

Orders should state initial and delivery pressures, connections, service and approximate volume of discharge. (See below.)

Made in all sizes, ½-inch to 12-inch. **Sizes 2-inch and smaller of composition only.** Larger sizes, iron body, composition trimmed. Screwed and flanged connections. Also make larger sizes in composition on order only.

Prices on application. Write for complete 1913 Catalogue No. 20.



ORDERS FOR PRESSURE REGULATING VALVES SHOULD SPECIFY:

1. Initial or boiler pressure.
2. Maximum and minimum delivery pressure.
3. Connections—screwed or flanged ends, giving diameter.
4. Sizes of both pipes leading to and from regulator.
5. Device or system to which it is to be applied.
6. For high or low pressure service.
7. Size of valve preferred and if we will be permitted to send a smaller size if we deem a smaller valve will give better results. By following our suggestions we often save considerable money for our users.
8. Any additional information towards an intelligent understanding of your requirements will insure your receiving a valve best suited to meet conditions.

JULIAN D'ESTE COMPANY

24 CANAL ST., BOSTON, MASS.

BRASS FOUNDERS, FINISHERS AND MACHINISTS, SOLE MANUFACTURERS OF CURTIS ENGINEERING SPECIALTIES, INCLUDING DAMPER REGULATORS, IMPROVED PRESSURE REGULATORS, IMPROVED PUMP REGULATORS, WATER PRESSURE REGULATORS, EXPANSION TRAP, RETURN STEAM TRAP, BALANCED STEAM TRAP, RELIEF VALVE FOR STEAM AND WATER, STEAM SEPARATOR, TEMPERATURE REGULATOR, PUMP GOVERNOR AND PUMP, BLOWER VALVE, CELLAR DRAINER, U. S. BALL COCK, ETC.

[illegible]

THE CURTIS IMPROVED (PATENT) DAMPER REGULATORS

The [illegible] is operated by steam direct from the boiler, and [illegible] pressure on the boiler is therefore available to operate [illegible] practice, only enough pressure is used [illegible] more than ten pounds to the [illegible].

[illegible] will begin to change from one direction [illegible] steam pressure of one half of [illegible] at which it is set to operate. [illegible] over the best [illegible] and lever regulator. [illegible]

[illegible] will pay their cost [illegible]

IMPROVED STEAM PRESSURE REGULATORS

[illegible]

Steam Pressure Regulator

THE CURTIS BALANCED STEAM TRAP

Some Points of Superiority

1. A perfectly balanced valve.
2. An absolutely frictionless valve.
3. The valve can be removed without breaking a joint, starting a gasket, or taking out a bolt.
4. The valve being frictionless and balanced, the whole power of the float is available for opening and closing the valve.

[illegible] as hermetically sealed as a glass [illegible] strong and tight at 250 lbs. pressure. [illegible] operation. [illegible] varying from one to 250 pounds.

Balanced Steam Trap

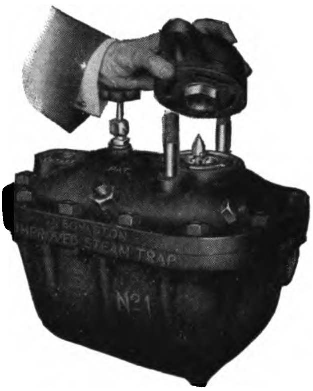
[illegible]

BOYLSTON STEAM SPECIALTY CO.

CHICAGO, ILL.

MANUFACTURERS OF STEAM SPECIALTIES: STEAM TRAPS; REGULATING VALVES, BACK PRESSURE VALVES, TANK VALVES; TEMPERATURE CONTROLLERS; STRAINER DEVICES, ETC.

THE BOYLSTON STEAM TRAP


Showing Simplicity of Accessibility

Our 29 years of experience in the STEAM TRAP business have been focalized in the design of a line of STEAM TRAPS, THE BOYLSTON, which are as nearly perfect as mechanical skill and an understanding of requirements can make them.

The modern demand calls for a TRAP of CAPACITY, DURABILITY and POSITIVENESS in operation, and one which allows EASY ACCESSIBILITY to its WEARING PARTS, which points are embodied in the BOYLSTON "Get-at-able" Quick Repairable Improved STEAM TRAP. Other meritorious features are the LONGEVITY of the SEAT and DISC, coupled with the EASE and CHEAPNESS of renewals, without breaking a single pipe-connection—removing the cover, or breaking a GASKET.

In the design of the BOYLSTON STEAM TRAP, we have eliminated the objectionable features, such as COLLAPSIBLE FLOATS, COUNTERBALANCE WEIGHTS, multiplicity of LEVERS, superfluous JOINTS, etc., all of which serve no real or valuable purpose other than to complicate the device. The open-bucket non-collapsible FLOAT is used with a resulting LARGER CAPACITY of the BOYLSTON TRAP.

ALL CASTINGS AND PARTS used in BOYLSTON STEAM TRAPS are interchangeable, ACCURATELY MACHINED by SPECIAL TOOLS and TEMPLATES made for that purpose.

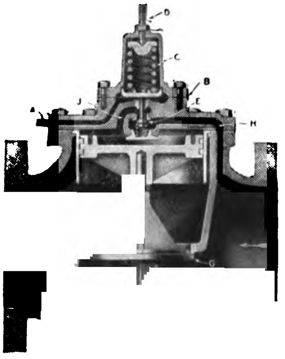
The MATERIAL WE USE for the SEAT and VALVE DISC (the only wearing parts) in the BOYLSTON STEAM TRAP is made from BOYLANEY METAL—the hardest known non-corrosive metal in existence.

All other castings are of CHARCOAL GUN IRON.

Boylston Traps Are Made in the Following Classes:

Style A, for pressure ranging from 1 to 30 lbs.
Style B, for pressure ranging from 30 to 125 lbs.
Style C, Extra Heavy, for pressure ranging from 125 to 250 lbs. per sq. in.
Style D, with Unlimited Valve, suitable for pressure from 1 to 125 lbs.
Style E, Extra Heavy Pattern, with Unlimited Valve suitable for pressure from 125 to 250 lbs.

BOYLSTON HIGH PRESSURE PILOT REDUCING VALVE



This valve belongs in a class by itself, and is an entirely different device from the regular common commercial reducing valve.

It is so sensitive and reliable that delivery pressure can be adjusted from as low as 5 pounds to within nearly the initial pressure, and when adjusted the delivery pressure will remain constant regardless of variations in the initial pressure or volume of discharge.

Even with a wide range of operation, no part i of delicate construction nor can the parts be easil deranged.

Can be made of steel and nickel suitable fo erheated steam at additional cost.

New General Catalog No. 12 fully describes Boylston Specialties.

AMERICAN STEAM GAUGE & VALVE MANUFACTURING CO.

FACTORY AND GENERAL OFFICES, BOSTON, MASS.
SALES OFFICES: NEW YORK, CHICAGO, ATLANTA, PITTSBURGH

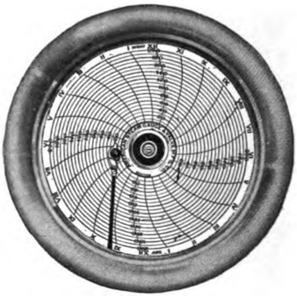
MANUFACTURERS OF STEAM TRAPS, GAUGES, VALVES, INDICATORS, AND KINDRED APPLIANCES FOR GOVERNING, INDICATING, MEASURING, RECORDING AND CONTROLLING STEAM, WATER, AIR, GAS, OIL, AMMONIA, AND ALL OTHER PRESSURES.

Bourdon Gauge

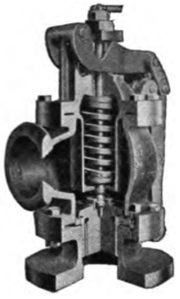
AMERICAN GAUGES are the simplest in construction, yet so designed that maximum efficiency with longest service is assured to the user. Gauges are too often judged or selected from superficial inspection only, with little or no attention to interior construction—the vital part. In American Gauges only the best material and workmanship will be found, as well as accuracy. This means dollars in every sense of the word to the owner, in both operating and maintenance expense. We furnish gauges for every purpose, and especially invite inquiries for installations where operating conditions are unusually severe. Estimates promptly furnished.

AMERICAN RECORDING GAUGES

The economical operation of power is safely guarded by the use of accurate, durable Recording Gauges. American Recorders are constructed in the same reliable, workmanlike manner that is characteristic of all our products. The style of case is the same as our non-recording instruments, thus giving uniformity to gauge board installations. Highest grade clock movements are used, insuring accurate time records. Standard chart 8 inch, 24 hour. Special charts to order. Each gauge fitted with our improved fountain pen, requiring filling monthly. We specialize in engine room gauge boards complete, and invite inquiry.



Recording Gauge



Sectional View

AMERICAN SPECIAL POP SAFETY VALVE

This valve is designed embodying the best features found in our experience during the thirty years of spring loaded safety valve existence. Constructed of the highest grade materials, tested under actual working conditions, simple, efficient, and of few working parts, all being easily accessible, and *all* adjustments made from *outside* valve casing. It is the best in valve construction.

This valve is also made in outside spring pattern for superheated steam.

OUR SIXTY-THREE YEARS' RECORD IS BEHIND OUR GUARANTEE COVERING ALL GOODS WHICH WE MANUFACTURE.

AMERICAN STEAM GAUGE & VALVE MANUFACTURING CO.

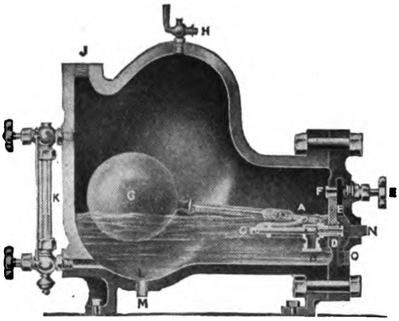
ESTABLISHED 1851

AMERICAN IDEAL STEAM TRAP

The essential feature of this trap is its valve leverage, which is many times more powerful than in any other float trap. POWER OF LEVERAGE is the principle involved in all steam traps. We, therefore, use heavy floats which positively will not collapse; and on traps for pressures 1 to 125 lbs., outlet is *full diameter*, thus giving a capacity many times greater than any other float, pot or bucket trap.

For HIGH PRESSURES this trap is also in a class by itself, having demonstrated its superiority by actual service and tests of unquestioned severity.

We can solve your Trap problems—send them to us.



Model C—Sectional View

TABLE OF CAPACITIES—MODEL C

	No. 1 Trap ½" Valve Opening			No. 2 Trap ¾" Valve Opening			No. 3 Trap 1" Valve Opening		
Pounds per Sq.In.	Capacity in Lbs. of Water per Hour	Capacity in Lineal Feet of 1" Pipe	Capacity in Square Feet of Radiation	Capacity in Lbs. of Water per Hour	Capacity in Lineal Feet of 1" Pipe	Capacity in Square Feet of Radiation	Capacity in Lbs. of Water per Hour	Capacity in Lineal Feet of 1" Pipe	Capacity in Square Feet of Radiation
1	2174	3864	1288	3240	5760	1920	5775	10250	3416
2	3114	5536	1846	4640	8240	2850	8220	14600	4863
3	3774	6709	2236	5631	10000	3333	10080	17930	5743
5	4831	8589	2863	7205	12800	4266	12790	25100	8366
10	6956	12367	4122	10345	18370	6123	18500	33200	11066
15	8555	15210	5070	12770	22700	7633	22680	40800	13600
20	9854	17520	5840	14660	26300	8766	26500	47500	15833
25	10996	19548	6516	16368	29100	9700	29100	52250	17416
30	12054	21429	7143	18000	32000	10666	32000	57400	19133
40	13869	24659	8219	20749	36900	12300	36950	66250	22083
50	15644	28800	9600	23373	41450	13816	41541	74500	24833
60	16943	30100	10050	25331	44700	13900	45100	80750	26916
80	19717	35200	11750	29404	52300	17433	52350	93750	31250
100	22158	39320	13200	33070	58750	19583	58800	105100	35033
125	24607	42800	14300	36818	65500	21833	65480	116800	38933

	No. 4 Trap 1¼" Valve Opening			No. 5 Trap 1½" Valve Opening			Number	Pipe Connections	List Price
1	9300	16620	5540	14194	25200	7400			
2	13600	24300	8100	20250	36000	12000			
3	16220	29000	9666	24598	42750	14250			
5	23450	41800	13933	26481	47500	15833			
10	30000	53600	17866	45373	80500	26833			
15	36800	65750	21916	55844	99400	33133			
20	42500	75850	25283	64357	114300	38100			
25	47250	84400	28133	71817	127600	42533			
30	51800	90700	30900	78768	140000	46666	1	½"	$30.00
40	60000	107300	35766	80913	143600	47866	2	¾"	40.00
50	67500	127500	42500	102225	182000	60666	3	1"	48.00
60	73890	136000	45300	110714	196500	65500	4	1¼"	60.00
80	84800	157000	52333	128715	227500	75833	5	1½"	80.00
100	95450	169500	56500	143277	254200	84733	6	2"	165.00
125	106200	188500	62833	160893	286020	95306	7	2½"	200.00

MOREHEAD MFG. CO.

DETROIT, MICH.

TILTING STEAM TRAPS, RETURN, NON-RETURN, VACUUM AND CONDENSER TYPES, FOR DRAINING HIGH OR LOW PRESSURE AND VACUUM HEATING SYSTEMS OF WATER OF CONDENSATION, and where desired, returning the condensation to the boiler as feed water.

RETURN STEAM TRAP

Morehead Return Steam Trap

The Return Steam Trap removes water of condensation from heating, drying and cooking apparatus and returns the condensation direct to the boilers regardless of any difference in pressure on the apparatus drained and the boiler or whether the apparatus is located above or below the water line. It is admirably adapted for use as a lift pump and for feeding boilers from open or closed heaters. It handles perfectly, water at any temperature.

NON-RETURN TRAP

Morehead Non-Return Steam Trap

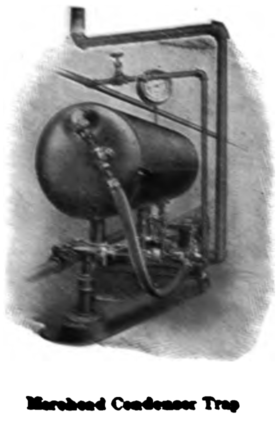
This type of Morehead Steam Trap is especially adapted to the removal of condensation from high or low pressure steam mains, dryers, heaters, etc., and delivering the water to an open tank, hot well or feed water heater. This trap has a removable seat and disc in the valve. It discharges from low point, insuring an effective *water seal* at all times. It is guaranteed for 200 lbs. working pressure.

VACUUM TRAP

The Vacuum Trap removes automatically all condensation from exhaust lines and oil separators operating under a vacuum without breaking or impairing that vacuum. It delivers the water of condensation to any desired point above or below the location of the trap and is guaranteed not to affect the vacuum in in any way.

CONDENSER TRAP

The Condenser Trap is a combination of the features of a Morehead Automatic Return Trap and the Jet or Spray Condenser. It is especially adapted to service on exhaust steam and reduced pressure heating, cooking and drying apparatus. The *positive vacuum* formed in the tank of the trap removes rapidly all condensation in the system, accelerates the travel of the steam and reduces the back pressure on the engine.



Morehead Condenser Trap

This is a cut of an actual installation. The check valves and gage shown in cut are only furnished as extras.

There is a Morehead Steam Trap to meet every condition arising in a steam or gas plant.

MOREHEAD MFG. CO.

MOREHEAD TILTING NON-RETURN STEAM TRAPS

No.	Inlet Inches	Outlet Inches	Capacity in Water Discharged per Hour	Drainage Capacity in 1 inch Pipe Lineal	Capacity Square Feet Direct Radiation	Capacity Lineal Feet Hot Blast Heater	Weight
21	1	1	200 gal.	12000 ft.	3000	1300	100
22	1¼	1¼	400 "	25000 "	5200	2400	175
23	1½	1½	600 "	40000 "	12000	5200	250
24	2	2	720 "	60000 "	21000	9000	275
25	2½	2½	900 "	90000 "	33000	16000	350
26	3	3	1300 "	140000 "	50000	25000	450

MOREHEAD TILTING RETURN, VACUUM AND CONDENSER STEAM TRAPS

Sizes and Capacities

No.	Size of Drum	Size of Inlet and Outlet Connections Inches	Size of Steam Pipe Connections Inches	Capacity of Water in Lbs. per Hour	Drainage Capacity in feet of 1 inch Pipe Lineal	Capacity Square Feet Direct Radiation	Capacity Lineal Feet Hot Blast Heater	Weight
1	10 x 24	1	1	1050	5000	2300	1000	100
2	12 x 30	1¼	1	1850	9000	4000	1800	175
3	14 x 36	1½	1¼	4000	20000	9000	4000	250
4	16 x 40	2	1¼	6000	35000	16000	7000	275
5	18 x 42	2½	2	11000	50000	25000	12000	350
6	18 x 42	3	2	15000	75000	40000	18000	400

The above capacities are figured on a basis of 50 pounds pressure to the square inch. The above drainage capacity in inch pipe is based on ordinary radiating conditions. For lumber kilns, greenhouses and moist goods, divide by two. For laundries, brick dryers and wet goods, divide by three. For fan stacks and blowers, divide by five.

NOTE—3 feet of 1 inch pipe equals one square foot of surface. 2.3 feet of 1¼ inch pipe equals one square foot of surface. 2 feet of 1½ inch pipe equals one square foot of surface. 1.61 feet of two inch pipe equals one square foot of surface.

MOREHEAD RECEIVERS

No.	Length Inches	Height Inches	Diameter Inches
1	30	16	10
2	40	20	12

No. 1 Receiver has capacity for Traps Nos. 1 and 2. No. 2 Receiver has capacity for Traps Nos. 3, 4, 5 and 6.

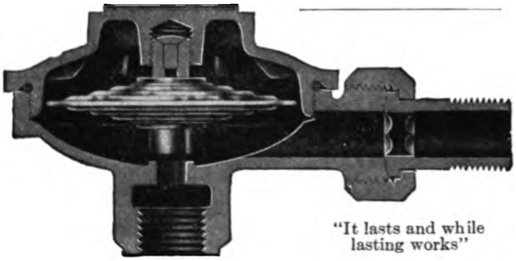
We will be glad to advise regarding the installation of traps to meet the conditions of your steam system.

C. A. DUNHAM COMPANY

MARSHALLTOWN, IOWA

NEW YORK: No. 1 MADISON AVE. CHICAGO: 343 S. DEARBORN ST.
SAN FRANCISCO: 602 MONADNOCK BLDG.
CANADIAN FACTORY AND OFFICE: TORONTO, ONTARIO

MANUFACTURERS OF THE DUNHAM RADIATOR TRAP, THE DUNHAM BLAST TRAP, THE DUNHAM AIR VALVE AND THE DUNHAM VACUUM AND VACUO VAPOR SYSTEMS OF HEATING.



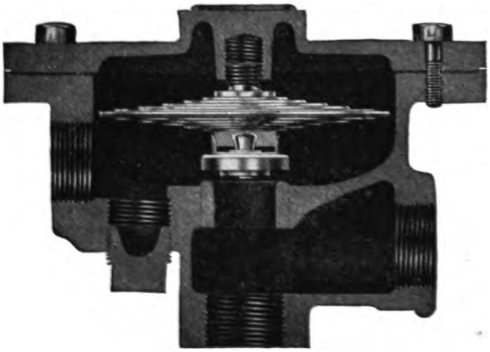
"It lasts and while lasting works"

The Dunham Radiator Trap

THE DUNHAM RADIATOR TRAP

for use in connection with the Dunham Vacuum and Dunham Vacuo Vapor Systems of Steam Heating. It will positively allow for the complete discharge of water and air from the radiator to which it is attached without loss of steam. Constructed of phosphor bronze.

Made in four patterns—Right hand, left hand, straight way and angle.
Size connections—½ inch pipe. Capacity—350 sq. ft. direct radiation.
Maximum steam pressure—10 lbs. Wt. 2½ lbs.



The Dunham Blast Trap

Size	Capacity	Connection	Wt.
¾"	1500 sq. ft. direct radiation	¾" pipe	13 lbs
1"	3000 " " "	1" pipe	21 "

THE DUNHAM BLAST TRAP

for use in draining blast coils in vacuum or other steam heating systems. Also for use on large direct radiating units where the Dunham Radiator Trap is too small. Positively opens for water and air and closes for steam. Body made of cast iron.

Care must be taken in reducing blast surface to equivalent direct by multiplying by a factor ranging from 3 to 9, depending upon the temperature, velocity and volume of air being forced over the coils.

THE DUNHAM AIR VALVE

This valve is made for use in revamping both old and new air-line jobs. It is built upon the same principle as the Dunham Radiator Trap. Is made of cast bronze, nickel plated all over and has union nut and nipple. Made for ½ inch pipe connection. Architects and engineers can specify this valve with the positive assurance that it will give service without necessitating the attention that is required to keep so many other air line valves in working order.

DUNHAM VACUO VAPOR SYSTEM

is simply a low-pressure system of heating that works upon pressure, vapor, and vacuum, without necessitating the use of a vacuum pump. It is particularly applicable to residence, apartment house, and church heating where low pressure (below 2 lbs.) boilers are used.

Complete information, catalog and prices will be sent on application.

The Dunham System is installed in such buildings as the Woolworth Bldg.; N. Y.; 80 Maiden Lane Bldg., N. Y.; Insurance Exchange Bldg., Chicago; Sherman Hotel, Chicago, and hundreds of other buildings all over the country.

NASON MANUFACTURING COMPANY

71 Fulton Street,
NEW YORK

32 Davis Street,
LONG ISLAND CITY

MANUFACTURERS OF STEAM, HYDRAULIC, GAS, REFRIGERATING AND SANITARY ENGINEERING SUPPLIES.

THE NASON-VESUVIUS STEAM TRAP

Fig. 1 shows the interior view of the Nason-Vesuvius Trap. A novel point, worthy of note, is the regrinding ball valve, which has a positive intermittent discharge and to which is imparted a positive rotating motion. This feature eliminates the usual trap troubles due to scoring of the valve surfaces, for the valve is either wide open or shut tightly. Furthermore, a slight rotative motion is given the ball, making a new seating surface at each discharge—thus uniformly distributing the wear.

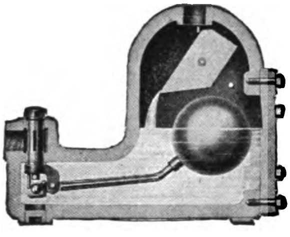


Fig. 1

Because of the large discharge orifice, the trap is freed from the collected condensation in minimum time, with a subsequent reduction of scoring effect on valve.

To substantiate these claims, we call attention to the fact that our repair sales have amounted to approximately $15.00 during the past five years, and in view of the large number of traps in operation, this amount indicates that the cost of maintenance is a negligible quantity.

"CLASS L," 1 TO 50 LBS. "CLASS M," 50 TO 150 LBS
"CLASS H," 150 TO 250 LBS.

No.	0	1	2	3
Pipe connection	¾"	1"	1¼"	1½"
Square feet surface	1600	2400	3100	4300
Discharge lbs. water per hour	560	830	1080	1520
List, each	$28.00	$35.00	$42.00	$50.00

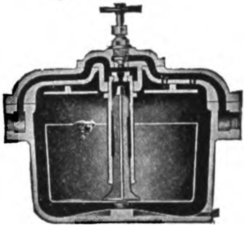


Fig. 2

"NASON" STEAM TRAPS

Fig. 2 illustrates the cross-section of the Nason Steam Traps in the "Class B," "Class C" and "Sidelug" types, and is an actual section of the "Class B" and "Class C" group.

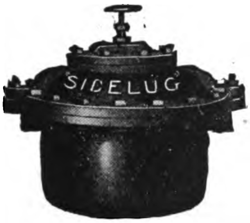


Fig. 3

In the "Sidelug," as will be noted in Fig. 3, the body construction differs, in that extension lugs are cast over the inlet and outlet ports, so reinforcing the flange joints at these points that leakage is rendered impossible through the blowing out of the gasket.

The "Sidelug" castings are also made extra heavy for working pressures to 150 lbs.

The function of all these traps is to automatically discharge the condensation from heating surfaces of every description, without loss of pressure or waste of steam.

"CLASS B," 1 TO 20 LBS. "CLASS C," 20 TO 70 LBS. "SIDELUG," 40 TO 150 LBS.

No.	1	2	3	4	5
Pipe connection	½"	¾"	1"	1¼"	1½"
Square feet surface	500	1150	1750	2550	4000
Discharge lbs. water per minute	4½	6½	10	15½	23
List, each, Class B, Class C	$16.00	$20.00	$27.50	$42.50	$70.00
List, each, Sidelug	16.85	21.30	29.25	45.50	74.75

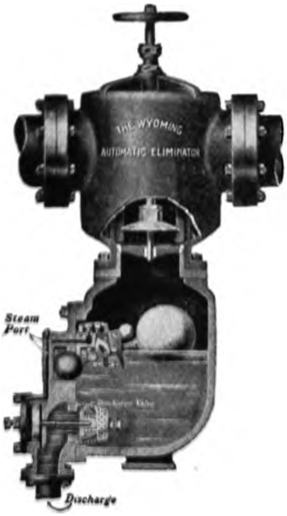
Special Catalogues on request. All lists subject to discounts.

W. H. NICHOLSON & CO.

WILKES-BARRE, PA.

MANUFACTURERS OF THE WYOMING ELIMINATOR AND THE WYOMING STEAM TRAP.

THE WYOMING AUTOMATIC ELIMINATOR



Horizontal Type

This is a combination steam separator and trap, for eliminating water, moisture and impurities from live steam. The separator portion of the HORIZONTAL TYPE has an arrangement of four corrugated baffle plates that has been patented by us. These plates are so placed that the steam in passing through is obliged to make a double "S" turn.

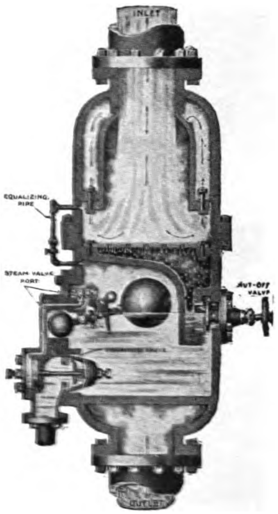
The trap is not what is commonly known as the float operated type. The float is instrumental only in releasing the latch when the water has reached a predetermined level. The ball weight released by the latch causes live steam to be admitted behind the piston. The full steam pressure behind this piston moves it forward and opens the discharge valve instantly. The water passes out and permits the float to fall to its lowest position. The weight of the downward moving float raises the ball weight to its suspended position where it is held by its latch in readiness for the next discharge.

From the illustration of the VERTICAL TYPE it will be noticed that the steam, after entering the separator, impinges against the centre perforated baffle, causing the water, moisture and impurities, with the aid of gravity, to drop to the trap section below. The sudden reversal of direction of steam current, causes all moisture to be thrown out that does not come directly in contact with the perforated plate.

The trap portion is practically the same in both types. The entire machine is compact and, in fact, takes up no more room than the ordinary separator.

The Wyoming is guaranteed to supply steam that is 99.5% dry, and up to as near perfect separation as is possible with a separator, without causing back pressure.

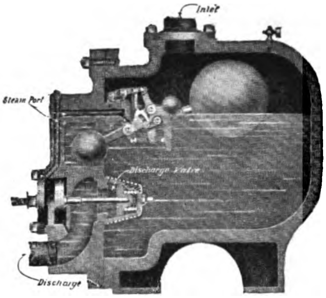
We are prepared to ship promptly such sizes of either the horizontal or vertical type as are suitable for the following diameters of steam pipe: 2½", 3", 3½", 4", 4½", 5", 6", 7", 8", 9", 10", 12", 14" and 16".



Vertical Type

W. H. NICHOLSON & CO.

THE WYOMING PISTON OPERATED TRAP

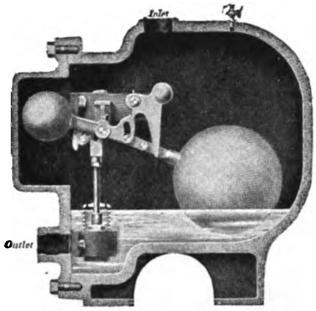


This trap is what might be termed an Automatic Piston Operated Valve. The valve gear is identical with that used in connection with the trap of the Eliminator, incorporating all of the essential features necessary in producing the highest efficiency in a steam trap. The non-wire-drawing, water-sealed, piston operated discharge valve is an approach to perfection in this line. It means a long life for the valve and seat, as it has a quick discharge, not a long drawn out, valve cutting, continuous flow discharge, squeezing through a ¼" hole at 100 lbs. pressure.

SIZES AND PRICES

Code Word	Jot	Joy	Jolt	Jove	Jog
Size Number	1	2	3	4	5
Capacity for draining all Condensation from Steam Pipe	1" to 3"	4"-5"	6"-7"	8"-9"-10"	12"-14"-16"
Size of Inlet Pipe	1¼"	2"	2½"	3½"	4½"
Size of Outlet Pipe	1"	1½"	2"	3"	4"
Size of Discharge Valve Opening	1"	1½"	2"	3"	4"
Maximum discharge in gallons per hour at 100 lbs. pressure	2400	4200	6500	11520	21000
Approximate Shipping Weight	132 lbs.	260 lbs.	325 lbs.	540 lbs.	575 lbs.
Price	$80.00	$100.00	$116.00	$144.00	$180.00

These Traps Will Operate from 150 *lbs. Down to* 5 *lbs. Pressure.*



THE WYOMING WEIGHT OPERATED TRAP

The float is only instrumental in releasing the valve weight, which in dropping, lifts the discharge valve. No dependence whatever is placed upon the buoyancy or weight of the float to lift the discharge valve. The valve weight consists of a levered cast-iron ball, the weight of which governs the capacity or size of hole through the discharge valve seat. The valve mechanism is of the quick opening and closing type, dispensing entirely with wire-drawing through the discharge valve. The discharge valve is covered by at least three inches of water at all times, making a water-sealed valve, thus preventing any possible escape of steam. All parts are attached to the cover which can be removed within a few minutes.

Size Number		No. 1	No. 2	No. 3	No. 4	No. 5	No. 6
Size of Inlet Pipe connections		½"	¾"	1"	1¼"	1½"	2"
Will drain lineal feet of 1" pipe		3500	5500	9500	14500	25000	35000
Intended for square feet of radiation surface		1500	2000	3200	5500	12000	24000
Maximum discharge in gallons per hour at 5 lbs. pressure		350	400	780	1560	2000	3100
Maximum discharge in gallons per hour at 100 lbs. pressure		275	310	415	580	750	1200
Dimensions	Height	14"	14"	14½"	14½"	18¾"	18¾"
	Width	9"	9"	10"	10"	11"	11"
	Length	16½"	18"	17"	20"	19½"	22½"
Shipping Weights		122	130	140	150	240	275
List Price		$20.50	$22.50	$28.00	$35.00	$50.00	$70.00

FOR ALL PRESSURES FROM 0 TO 150 POUNDS

PENBERTHY INJECTOR CO.

DETROIT, MICH.

New York City; Windsor, Can.; London, Eng.; Hanover, Germany and Paris, France

MANUFACTURERS OF INJECTORS, EJECTORS, STEAM SPECIALTIES AND LUBRICATING DEVICES

AUTOMATIC INJECTORS

All our claims for the "Penberthy" Injector are based on actual tests, as we have set for this machine a very high standard, which for years has been steadily advanced, and the "Penberthy" to-day is better than ever before. Every "Penberthy" Injector is carefully tested before leaving the factory, and no machine is allowed to go out that will not work on the following points, while nearly all of them will do much better:

Start Low, 20 to 22 lbs. steam on 3-foot lift.
Work High, 165 to 170 lbs. steam on 3-foot lift.
Lift Water, 20 to 24 feet on 60 to 80 lbs. steam.
Handles Hot Water,
125° to 130° at 60 to 80 lbs. steam.
115° to 120° at 100 lbs. steam.
95° to 104° at 125 lbs. steam.

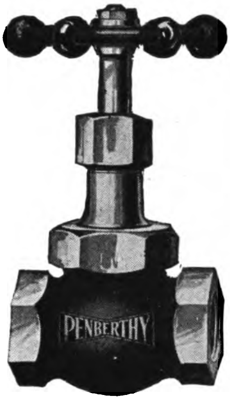
Automatic Qualities.—The Penberthy is a perfect restarting automatic machine. By this we mean, when the Injector is working and forcing water to the boiler, if the current of water be suddenly broken by any cause, such as a sudden jar or jolt, as in the case of a traction engine or road roller or in the case of a marine boiler, by the rolling of the vessel throwing the sea-cock out of the water for a moment, the Injector will pick up the water and again establish the current to the boiler automatically, without the manipulation of a single valve or the least attention from an attendant.

"XL-96" IMPROVED EJECTOR

The *lifting* and *elevating* power is so combined in the XL-96 ejector as to make it unquestionably the best device of its kind. All other ejectors which will lift 20 feet will elevate but 20 to 25 feet additional, and this only on very limited steam pressures, and it is therefore necessary to locate other ejectors to within a few inches of the surface of water and operate with excessive steam pressure if it is desired to transfer water any great distance vertically. The XL-96 ejector lifts 22 to 25 feet. Elevates [illegible] to 100 ft. 30 to 100 lbs. pres. *Write for further information.*

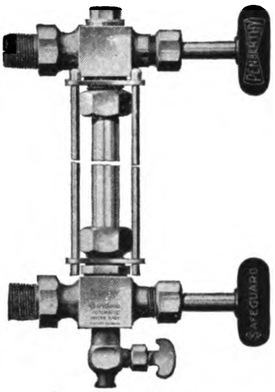
PENBERTHY INJECTOR CO.

REGRINDING GLOBE VALVES



The ever increasing demand to-day by Power Plant owners and steam users in general is for valves that will give absolutely reliable service and dependability under high pressures and severe conditions, and that are free from unnecessary renewal of discs and repair parts. To meet this demand the Penberthy Regrinding Valve has been designed. It is the result of many years practical experience in the manufacture of high grade brass goods, and embodies the best mechanical ideas ever employed in mechanical construction. It is the heaviest regrinding valve manufactured, and the distribution of metal is such that parts subjected to the greatest strain and wear have proportionately heavier walls. For the present we illustrate only the medium pattern type, which we guarantee to stand a constant working pressure of 200 pounds.

SAFEGUARD WATER GAGE



The Penberthy Safeguard Automatic Water Gage is tested to 300 pounds and given a thorough examination before being sent out from the factory. *Constructed* simple and strong, there are no springs or levers to get out of adjustment, no unnecessary parts or complications. Operates on any pressure. *Self-Cleaning* by the action of the blow-off vibrating the balls. The cleaning stem in lower shank goes all the way through into the boiler, absolutely preventing opening from ever being closed by scale, etc. All dirt, deposit and sediment is forced out through pet-cock each time glass is blown. *Balls cannot seat unless the glass is broken* because the upper ball seat is designed to leak. This leak can never be stopped accidentally, as the ball seat is square in the ⅜″ and ½″ sizes and hexagonal shaped in the ¾″ size, allowing passages which, because of their shape and size, can never become clogged. This leak, also, is positively necessary to insure perfect operation of an automatic gage. It is the only mechanical means of preventing a false water level from being shown, and any automatic gage not so constructed is, for that reason, unsafe. The Penberthy dripless pet-cock, with which all Safeguard Gages are equipped, is slow-opening and closing, thus allowing the blowing off of the gage to be done gradually, which prevents the balls from seating as they might do in shutting off the quick-opening and closing pet-cock, with which all other automatic gages are equipped. *Write for further information.*

[illegible] EXPANSION JOINT

[illegible]

[illegible] RINGS

[illegible]

[illegible]

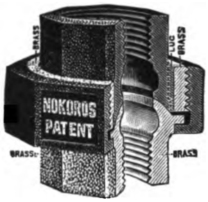
[illegible]

[illegible]

ILLINOIS MALLEABLE IRON CO.

1801-25 DIVERSEY PARKWAY, CHICAGO, ILL.

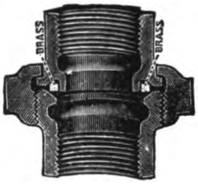
THE NOKOROS PATENT UNION



The only Union made absolutely NON-CORROSIVE at all contact points.
Non-corrosive Brass to Iron thread connection.
Non-corrosive Brass to Iron seat between ring and tail-piece.
Octagon shape, a monkey wrench will turn.

Size, inches	¼	⅜	½	¾	1	1¼	1½	2	2½	3
Plain, each	.19	.22	.27	.40	.48	.66	.80	1.14	2.10	2.65
Galvanized, each	.23	.26	.34	.49	.60	.82	1.10	1.40	2.75	3.50

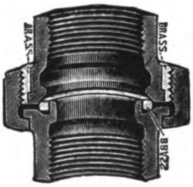
THE COMPRESSION DISC PATENT UNION



Heavy Pattern Air Furnace Malleable Iron with Brass Valve Seated Disc. The face of each threaded section is beveled to receive a brass disc, and the connecting up of the union COMPRESSES the brass DISC against the recesses, making a permanent steam metal seat.

Size, inches	¼	⅜	½	¾	1	1¼	1½	2	2½	3
Plain, each	.30	.40	.50	.60	.80	1.20	1.60	2.00	3.20	4.80
Galvanized, each	.45	.60	.75	.90	1.20	1.80	2.40	3.00	4 80	6.20

THE NEW IMICO PATENT UNION



New Imico Unions are made of non-corrosive malleable iron, extra heavy, with bronze metal valve seated disc and non-corrosive ring connection.

Size, inches	¼	⅜	½	¾	1	1¼	1½	2	2½	3
Plain, each	.30	.40	.50	.60	.80	1.20	1.60	2.00	3.20	4.80
Galvanized, each	.45	.60	.75	.90	1.20	1.80	2.40	3.00	4.80	7.40

Also Mfgr's of

MALLEABLE and CAST IRON FITTINGS

Write for Catalogue

E. B. BADGER & SONS [illegible]

[illegible]

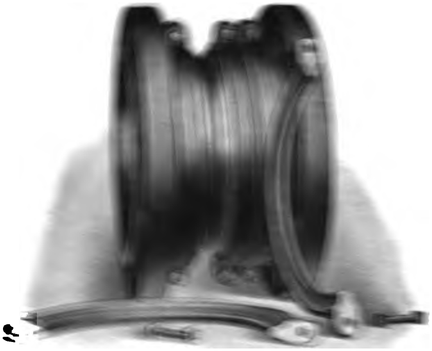
[illegible]

BADGER SELF-EQUALIZING EXPANSION JOINT

[illegible]

[illegible] RINGS

[illegible]



SIZES

[illegible] operating conditions and the [illegible] They are made [illegible] U. S. standards [illegible] taken to make [illegible] corrugations to [illegible]

LOW PRESSURE EXPANSION JOINTS

[illegible] low-pressure [illegible] less than [illegible] equalizing rings which [illegible] eliminate all danger [illegible]

SPECIAL FORMS

[illegible] various condi- [illegible] expansion [illegible] may not need [illegible] circular, oval, [illegible]

[illegible] we have facilities [illegible] engineer may [illegible]

ILL[illegible]

[illegible]

THE [illegible]

The [illegible]

[illegible]

Size, inc[illegible]

Plain, e[illegible]
Galvanize[illegible]

[illegible]

Heavy Pa[illegible]
The face of eac[illegible]
necting up of the [illegible]
making a permanen[illegible]

Size, inches [illegible]

Plain, each [illegible]
Galvanized, each [illegible]

THE NEW [illegible]

[illegible] are ma[illegible] of non-[illegible] and non-[illegible]

Size, inches [illegible]

Plain, each [illegible]
Galvanized, each [illegible]

[illegible]

MALLEABLE [illegible] CAST IRON [illegible]

[illegible]

[illegible] COMPANY

[illegible]

[illegible] STEAM, WATER AND GAS UNIONS [illegible]

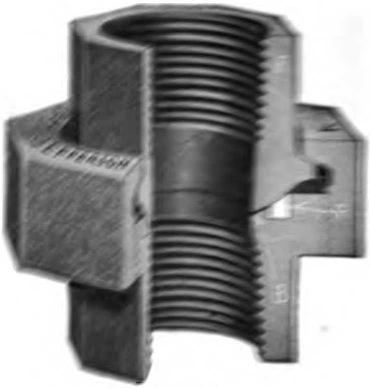


Fig. [illegible]
JEFFERSON UNION
All Female

[illegible] with spherical brass to iron seats [illegible] of wrought metal, cut from seamless brass tubing [illegible] brass. There are special advantages in the use [illegible] the manner shown and the wall B is patented owing to [illegible] protecting the brass from injury no matter how [illegible]. No gasket is used and there is plenty of play for the [illegible] in the nut.

[illegible] show a few of the many styles in which these unions [illegible] All Male, 90° and 45° Elbows, Tees, and [illegible]

[illegible] may be used for any angle.

[illegible] for use where pressures do not exceed 200 [illegible] the ends are screwed onto the two [illegible] the bolt holes in [illegible] the nuts without a moment's [illegible] will make up as tight [illegible]

[illegible] weights, the Style D for [illegible] pressures to 1000 lbs.

[illegible] Standard Taper Pipe Threads.

Fig. [illegible]
MALE AND FEMALE

Fig. 2
ALL MALE

JEFFERSON UNION COMPANY

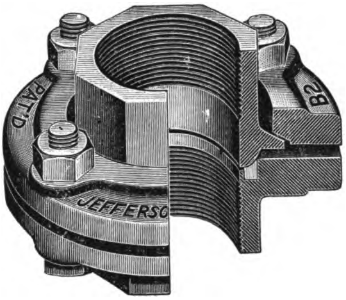


Fig. A 29
JEFFERSON FLANGE UNION
Three Part

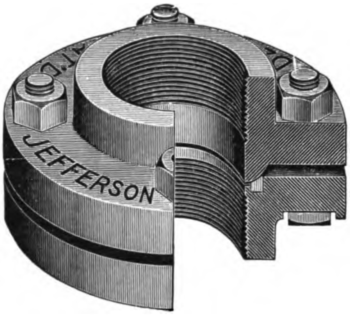


Fig. A 30
JEFFERSON FLANGE UNION
Two Part

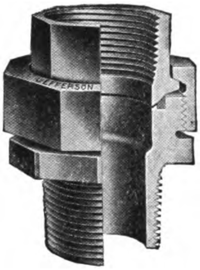


Fig. A 6
MALE AND FEMALE

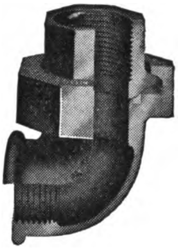


Fig. A 9
90° UNION ELBOW
All Female

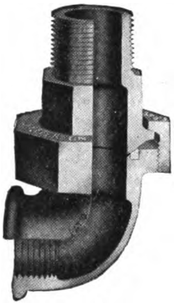


Fig. A 10
90° UNION ELBOW
Male and Female

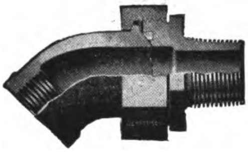


Fig. A 12
45° UNION ELBOW
Male and Female

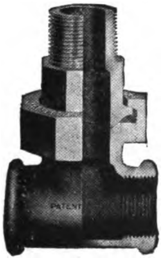


Fig. A 16
TEE-UNION ON OUTLET
Male and Female

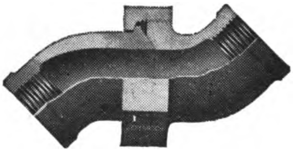


Fig. A 17
SWING UNION

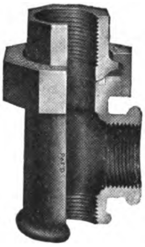


Fig. A 13
TEE-UNION ON RUN
All Female

JEFFERSON UNION COMPANY

LEXINGTON, MASS.

UNIONS AND FLANGES FOR OIL, STEAM, WATER AND GAS UNDER ALL PRESSURES. Malleable iron only is used for standard goods and brass tubing for rings for seats.

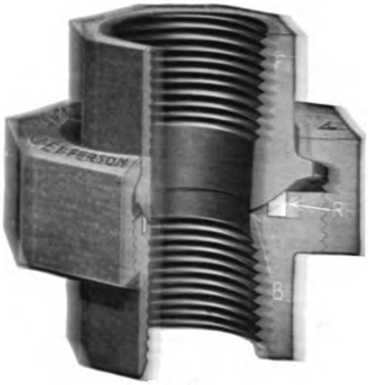


Fig. A 4
JEFFERSON UNION
All Female

Jefferson Unions are made with spherical brass to iron seats ground to a perfect fit. The ring R is of wrought metal, cut from seamless brass tubing, avoiding blowholes common in cast brass. There are special advantages in the use of the brass ring in just the manner shown and the wall B is patented owing to these advantages, which include protecting the brass from injury no matter how far the pipe is screwed in. No gasket is used and there is plenty of play for the part F which swivels in the nut.

The following illustrations show a few of the many styles in which these unions are made including Male and Female, All Male, 90° and 45° Elbows, Tees, and Reducing.

The Swing Union (Fig. A17) may be used for any angle.

The Three Part Flange (Fig. A29) for use where pressures do not exceed 20 pounds is very economical. In applying, the ends are screwed onto the tw pieces of pipe. Then the loose collar is swiveled around and the bolt holes i the flanges brought into position for screwing down the nuts without a moment' delay. Owing to the ball joint, the Jefferson Flange Union will make up as tigh when the pipes are slightly out of line as when they are in line.

The Two Part Flange (Fig. A30) is made in two weights, the Style D fo pressures to 500 lbs., and the Style E, extra heavy, for pressures to 1000 lbs.

All Jefferson Unions are made with Brigg's Standard Taper Pipe Threads.

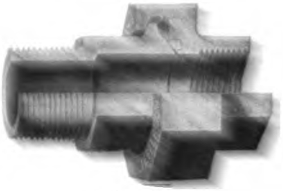


Fig. A 5
MALE AND FEMALE

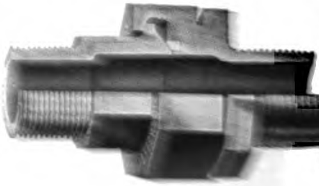
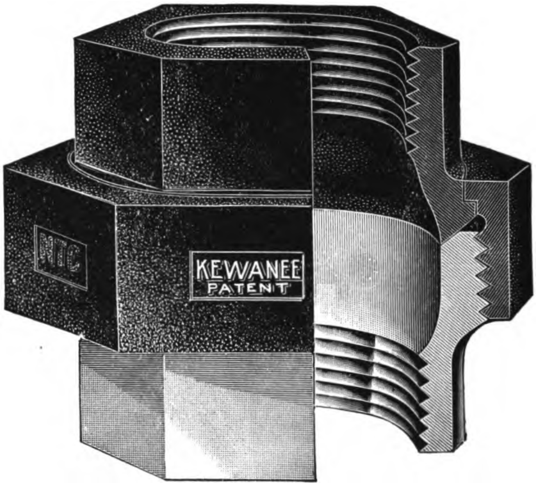


Fig. A
ALL MALE

NATIONAL TUBE COMPANY

"KEWANEE" UNIONS

"Kewanee" Combination Brass and Iron Ground Ball Joint.



Octagon Pattern, Fig. H-300

"The Union with no Inserted Parts"

Five "Kewanee" Advantages

(a) Brass to iron thread connection—No corrosion.
(b) Brass to iron ball joint seat—No Gasket.
(c) 125 pounds compressed air test under water—No defective fittings.
(d) Solid, three piece construction—No inserted parts.
(e) Easily disconnected—No force required.

These advantages are common to each type and pattern of "Kewanee" Unions and "Kewanee" Specialties.

"*The Whole Kewanee Family,*" an illustrated book of 48 pages, contains valuable information to users of unions and other fittings. Ask for a copy--its free! A post-card will bring it to you.

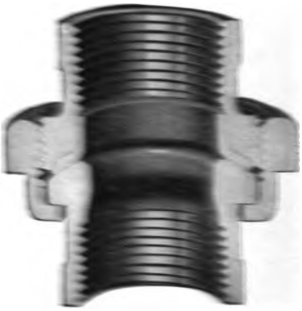
Size..................inches	⅛	¼	⅜	½	¾	1	1¼
Black..................each	.18	.19	.22	.27	.40	.48	.66
Galvanized............ "	.22	.23	.26	.34	.49	.60	.82
Size..................inches	1½	2	2½	3	3½	4	....
Black..................each	.80	1.14	2.10	2.65	4.30	5.50	....
Galvanized............ "	1.10	1.40	2.75	3.50	6.30	7.50	....

THE MARK MANUFACTURING CO.

EVANSTON, ILL. ZANESVILLE, OHIO

MAKERS OF WROUGHT PIPE AND COUPLINGS, BOILER TUBES, ELECTRIC WIRE CONDUIT, WELL CASING, WELL POINTS, PUMP AND WELL CYLINDERS, WELL STRAINERS, WELL VALVES AND TOOLS, PIPE CUTTERS, VISES, THREADING DIES AND PUMP AND WELL SUPPLIES.

Patents Pending



Patents Pending

THE MARK COLD DRAWN STEEL PIPE UNION

Leakless — Rustless — Different

Sherardized after threading to prevent Rusting, Corroding, Freezing.

This new type of pipe union consists of male and female ends and coupling nut, all of cold drawn [illegible] steel.

It will not leak, break or corrode—BECAUSE

1. It will expand and contract in [illegible] brass [illegible] with [illegible] not subject to damage [illegible] is unavoidable [illegible] brass unions are used [illegible]

2. It is [illegible] holes [illegible] to all [illegible] iron and [illegible]

3. It has a [illegible] seat [illegible]

4. [illegible]

5. It is [illegible]

6. [illegible]

SIZES AND LIST PRICES

Pipe Size	[illegible]	[illegible]	[illegible]	1¼	1½	2	2½	[illegible]
Steel	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Brass	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

ARMSTRONG CORK COMPANY

INSULATION DEPARTMENT

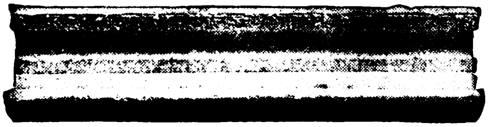
122 TWENTY-FOURTH STREET, PITTSBURGH, PA.

Branch Offices in the Large Cities

NONPAREIL HIGH PRESSURE COVERING for steam lines, boilers and all heated surfaces; NONPAREIL CORK COVERING for brine, ammonia and ice water lines; NONPAREIL CORK BOARD INSULATION for cold storage plants. CONTRACTORS for heat and cold insulation.

NONPAREIL HIGH PRESSURE COVERING

The heat-insulating efficiency of diatomaceous earth has long been recognized, but, until recently, no satisfactory process was available by which it could be bonded together in sectional form so as to produce a strong, efficient covering for high pressure and superheated steam lines. After years of research this problem was solved successfully and Nonpareil High Pressure Covering is the result.

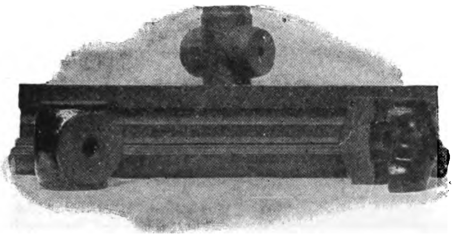


The peculiar porous structure of diatomaceous earth makes Nonpareil Covering a better nonconductor of heat than any of the coverings now in general use. Moreover, it will withstand temperatures at which other coverings calcine and disintegrate, is unaffected by moisture or steam, is easy to apply and reasonable in price. Tests demonstrating the truth of these assertions are fully described in our catalogue.

Nonpareil Covering is made in sectional, block and cement form. While comparatively new, it has already been installed in several hundred plants throughout the country and is giving universal satisfaction. Write for catalogue and sample.

NONPAREIL CORK COVERING

Nonpareil Cork Covering for brine, ammonia and ice water lines is composed of granulated cork slightly compressed and molded in sectional form to fit the different sizes of pipe and various fittings in ordinary use. It is coated inside and out with a mineral rubber finish and is applied with waterproof cement on the joints, rendering them impervious to moisture. Nonpareil Cork Covering possesses great insulating efficiency, is remarkably durable in service, is clean, neat in appearance and easy to apply.



It is manufactured in four thicknesses to meet different service conditions, viz.: 1. *Standard Brine Covering* for temperatures ranging from 0° to 25° F. 2. *Special Thick Brine Covering* for temperatures below 0° F. 3. *Ice Water Covering* for temperatures of 25° to 45° F. 4. *Cold Water Covering* for temperatures above 45° F.

Mitred cork lagging, beveled to any desired radius, is furnished for cylindrical tanks, filters, large sized pipes, etc. Catalogue and samples will be cheerfully forwarded, on request.

NONPAREIL CORKBOARD INSULATION

Nonpareil Corkboard is the world's standard cold storage insulation. It is composed of pure granulated cork, made into boards 12 x 36", of various thicknesses. Our bound book, "Nonpareil Corkboard Insulation," fully describing this material will be sent to anyone on request.

ROBERT A. KEASBEY CO.

[illegible] N. Moore St., NEW YORK [illegible]

PIPE AND BOILER COVERINGS—85% Magnesia, Asbestos, Air-Cell or [illegible], [illegible] Wool, Etc.

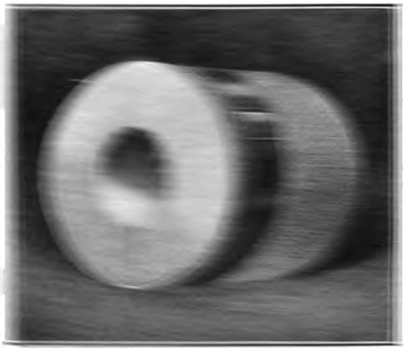
[illegible] MATERIALS of [illegible] Asbestos [illegible]

PACKINGS OF ALL KINDS—Asbestos, Flax, [illegible] Rubber, Metallic.

[illegible] AND [illegible] PAINT.

MAGNESIA SECTIONAL COVERING

[illegible]



[illegible]

[illegible] BRAID, ASBESTOS [illegible] AND RUBBER PACKINGS

[illegible]

[illegible]

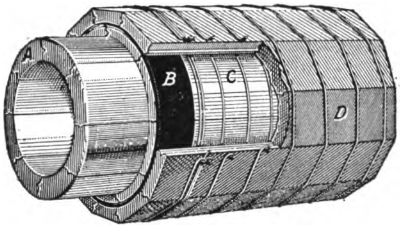
[illegible]

A. WYCKOFF & SON CO.

ELMIRA, NEW YORK

PITTSBURGH OFFICE, **Pittsburgh Terminal Warehouse**

MANUFACTURERS OF WYCKOFF'S IMPROVED STEAM CASING FOR UNDERGROUND OR EXPOSED STEAM LINES.



A—2 Inch Thick Inner Shell. **B—Asphaltum Packing.**
C—Dead Air Space. **D—1 Inch Thick Outer Shell.**

WYCKOFF'S IMPROVED CYPRESS STEAM CASING. MADE OF GULF CYPRESS, THE WOOD ETERNAL.

Gulf Cypress is used instead of Pine or Tamarack because Gulf Cypress is the only known wood not affected by Wet or Dry Conditions. The outer shell is one inch thick, the **inner shell two inches** and the **dead air space ¼ inch,** making the total thickness of the casing 3¼ inches. These improvements will more than double the life of former Wyckoff casings. The asphaltum packing and the driven joint makes the casing absolutely waterproof. This pipe casing is the ONLY ONE on the market with

¼" DEAD AIR SPACE BETWEEN THE SHELLS.

This dead air space between the shells has been increased 50 per cent over the former Wyckoff casing.

Send for our booklet to-day—it tells you all about these improvements.

[illegible] C.

[illegible] STRIBUTION [illegible]

[illegible]

[illegible] V[illegible] [illegible] Port [illegible]
[illegible] and super[illegible] to 600 [illegible]
[illegible]ALANCED [illegible]
[illegible] made for Intern[illegible]
Can be fitted to [illegible]
When Designing or Re[illegible] Balanced Valves.

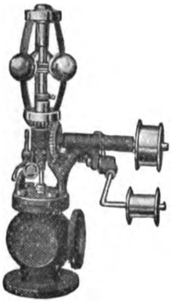
THE PICKERING GOVERNOR CO.

PORTLAND, CONNECTICUT

GOVERNORS FOR STEAM ENGINES, GAS ENGINES, STEAM TURBINES, MECHANICAL CONTROL AND POWER REGULATION.

Owing to the absence of joints our Governors are very responsive to slight changes in load, moving quickly and positively into correct position for maintaining the admission of steam proportionate to the duty required of the engine. Absence of joints gives maintenance in efficiency under continued and severe duty.

Speed Rangers are incorporated, permitting wide range in adjustment of Engine speed while running.

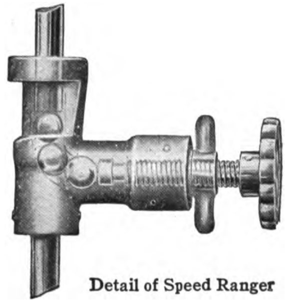


Class A

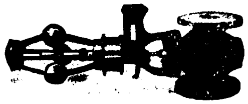
Class B Vertical

Gov. with Stop Valve

Class A Governors are equipped with safety stop which shuts off steam from the engine if governor drive belt should break. Class B are not equipped with safety stop. Horizontal B is never provided with safety stop. Governor with stop valve does away with joint between governor and valve.



Detail of Speed Ranger



Class B Horizontal

TABLE OF DIMENSIONS, ETC., FOR CLASSES A AND B

Diameter of Opening Size of Governor	1¼	1½	2	2¼	2½	3	3½	4	4½	5	6	7	8	9	10
From center of inlet to base..	3¼	3½	4¼	4½	5 1/16	5½	6¼	7 7/16	7 5/16	8	8 9/16	9	10	11½	11¾
Extreme Height..............	20 3/16	23 11/32	25 3/32	27¼	27 11/16	32 5/16	33 11/16	41 5/32	41 5/32	46½	49⅛	49⅜	53⅞	55⅞	60¾
Extreme expansion of Balls.	7	8	8	9	9	10	10	13	13	15	16½	16½	18	20	20
Speed of Governor.........	350	380	380	300	300	340	340	320	320	275	275	275	260	260	225
Dia. of Pulley on Gov......	2½	3½	3½	4	4	4	4	5	5	5	6	7	7	8	8
Dia. of Cyl. 300 ft. Piston Sp..	6	7	9	10	12	14	16	18	20	22	26	31	36	40	45
" " " 400 " " "	5	6	8	9	10	12	14	16	18	20	23	27	31	35	39
" " " 500 " " "	4½	5	7	8	9	10	12	14	16	18	21	24	28	31	35
" " " 600 " " "	4	4½	6	7	8	9	11	13	15	16	19	22	25	28	32

For complete table and for sizes below 1¼--see our general catalogue.

[illegible]

[illegible] RECORDING

[illegible]

[illegible]

[illegible]

[illegible]

S. F. BOWSER & COMPANY, Inc.

Established 1885

HOME PLANT AND GENERAL OFFICES, BOX 2167, FORT WAYNE, IND.

BRANCHES

U. S. A.

Albany
Dallas
Minneapolis
Atlanta
Denver
New York
San Francisco
Chicago
Harrisburg
St. Louis

FOREIGN

London
Johannesburg
Porto Rico
Toronto
Paris
Buenos Aires
Mexico City
Havana

Sales offices in all Centers and Representatives Everywhere

OIL SYSTEM ENGINEERS, PATENTEES AND MANUFACTURERS

Oil System Engineers, Original Patentees and Manufacturers of:

Oil Storage and Distributing Systems.

Self-Measuring Hand and Power Driven Pumps.

Underground Storage and Distributing Systems.

Large Tankage.

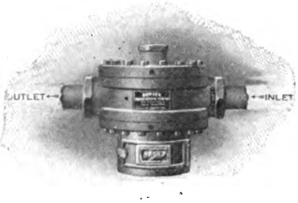
Automobile Filling Stations.

Dry Cleaner's Systems.

Self-Registering Pipe Line Measures.

Oil and Gasolene Storage and Distributing Outfits for Public and Private Garages.

Oil Filtering and Circulating Systems.



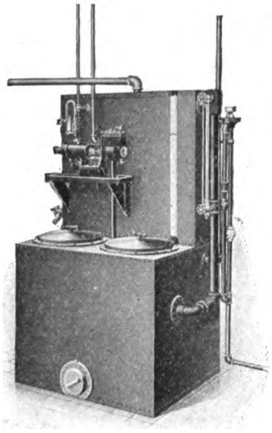
Registering Measure

The Bowser line covers every requirement of the factory and railroad for oil storage equipment.

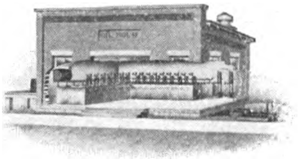
Our corps of mechanical and drafting engineers is at the command of those interested in this line.

Bulletins giving complete detailed description of any line will be furnished upon application and without obligation. We have a fund of information on oil storage and allied lines that will assist in making up specification for this work. Let us submit it.

Our catalogue illustrates and describes the line in a limited way and shows a large number of installations in widely diversified fields.



Oil Filtering System



A Representative Oil House

C. J. TAGLIABUE MFG. CO.

18 to 88 Thirty-Third Street, BROOKLYN, N. Y.

MANUFACTURERS OF INSTRUMENTS FOR INDICATING, RECORDING AND CONTROLLING TEMPERATURE AND PRESSURE.

MERCURIAL THERMOMETERS

[illegible]

Stationary Power Plants

Marine Power Plants

Refrigerating Systems

[illegible]

[illegible]

[illegible]

[illegible]

S. J. B[illegible]

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lbany
allas
[illegible]

[illegible]IL YSTEM [illegible]

[illegible] ystem [illegible]umpers. [illegible]

[illegible] Storage and [illegible]buting [illegible]

[illegible]elf-Measuring [illegible] and [illegible]
[illegible]ms.

[illegible]nderground [illegible]torage and [illegible]
[illegible]stems.

[illegible]arge [illegible]nkage.

[illegible]utomobile [illegible]lling [illegible]

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[illegible]il and Gasolene [illegible]
[illegible]nits for Public and [illegible]

[illegible]il Filtering and [illegible]

[illegible]

Single Feed

[illegible]

[illegible]

[illegible]

DETROIT LUBRICATOR COMPANY

DETROIT, MICH.

MANUFACTURERS OF LUBRICATORS, FORCE FEED OILERS, OIL AND GREASE CUPS, AIR AND GAUGE COCKS, PRIMING CUPS, BALANCED THROTTLE VALVES, WATER GAUGES, POP SAFETY VALVES, FUSIBLE PLUGS AND RADIATOR VALVES.

DETROIT SIGHT FEED LUBRICATORS

Detroit Lubricators are made in a sufficient variety of styles and kinds to properly lubricate the valves and cylinders of all types of steam engines, steam pumps, gas engines, air compressors, etc. The complete line includes 146 styles and sizes of lubricators—one for every kind of service.

IMPROVED STANDARD LUBRICATOR

Double Connection

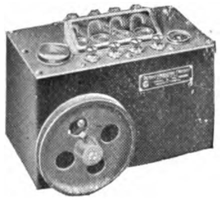
For use on all kinds of steam engines, steam pumps, etc.

Installed with both connections between the boiler and the throttle.

Finished in polished brass or nickel plated.

Size	1/3 Pt.	1/2 Pt.	1 Pt.	1 Qt.	1/2 Gal.	1 Gal.
Pipe Thread on Support Arm	1/2	1/2	1/2	1/2	3/4	3/4

DETROIT FORCE FEED OILERS

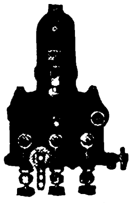


Four Feed Force Feed Oiler

Detroit Force Feed Oilers are designed for the mechanical lubrication of gas and gasoline engines, air compressors, etc. The advantages of this system of lubrication are: cool, clean oil forced by mechanical pressure and in quantities as needed to the proper point to be lubricated, the elimination of the possibility of injury from running dry or carbon deposits, and very little attention from the operator as there is only one tank to fill.

They are made with 1 to 30 feeds and corresponding capacities of 3 to 18 pints, using a standard tank, 4⅜" wide and 5" high. Special models for gas tractors, marine and stationary engines, automobiles, commercial trucks and aeronautical motors.

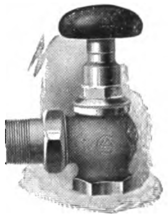
DETROIT LOCOMOTIVE LUBRICATORS



Three Feeds
Three Pints Capacity

Detroit Locomotive Lubricators are thoroughly suited to fulfill all the requirements of every style of locomotive from the saturated simple engine to the most modern superheated Mallet. The No. 22 Type of Bullseye Lubricators is recommended as possessing improvements and refinements made desirable by the needs of modern locomotive practice, resulting in a low cost of maintenance and economy in oil. Made with from one to eight feeds.

DETROIT RADIATOR VALVES



Packless

Detroit Radiator Valves embody in their design the results of years of experience in the manufacture of all kinds of valves for all styles of heating installation. The Detroit Packless Valve fulfills the need for a radiator valve that will not leak around the stem nor need repacking. Its construction makes it perfectly adapted also for use in vacuum systems where tightness is essential.

HILLS-McCANNA COMPANY

[illegible] W. LAKE ST., CHICAGO, ILL.

[illegible]

[illegible] New York City,
[illegible]
[illegible] Representative, 2[illegible] Twentieth St., Birmingham, Ala.

[illegible] FORCE FEED LUBRICATING PUMPS, HIGH PRESSURE [illegible] SWING JOINTS FOR BEARINGS, LOW [illegible] METALLIC DISCS FOR VALVES.

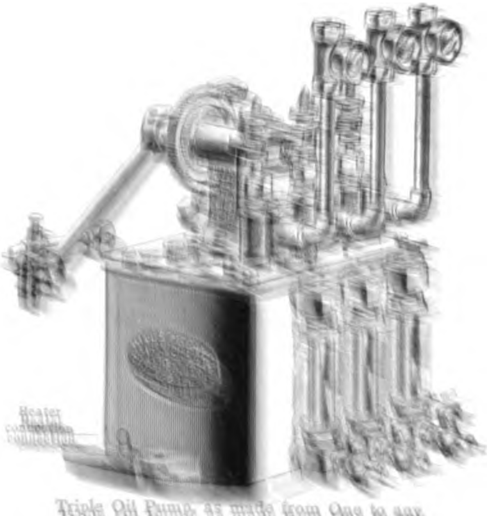
**Single Oil Pump with Glass Holder
One Pint and One Quart sizes only**

FORCE-FEED LUBRICATING OIL PUMPS

[illegible] Oil Pumps have received the [illegible] and [illegible] applications, [illegible] unvaryingly successful [illegible].

[illegible]

[illegible]



Triple Oil Pump, as made from One to any number of feeds

APPLICATIONS

Hills-McCanna Force Feed Lubricating Pumps are illustrated in our catalog in successful service on

Elevator Pumps
Boiler Feed Pumps
Four-Valve Engines
High Speed Engines
Marine Motor Engines
Gas Engines
Steam Shovels
Steam Hammers

[illegible]

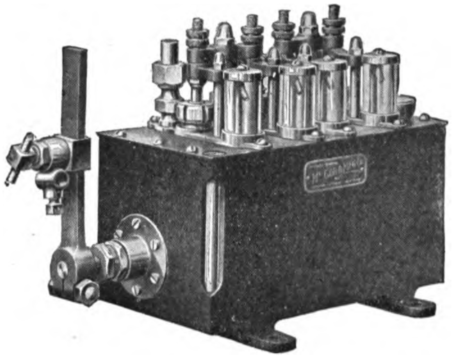
McCORD MANUFACTURING CO.

DETROIT, MICH.

NEW YORK CHICAGO

MANUFACTURERS OF FORCE FEED LUBRICATORS

The McCord Force Feed Lubricator delivers either much or little oil, always in the right quantity, where and when wanted with the regularity of clockwork.



Class B—Four Feed

"McCORD" FORCE FEED LUBRICATORS

The McCord Lubricator is adapted to a wide diversity of applications. Prominent manufacturers of STEAM AND GAS ENGINES, PUMPS, COMPRESSORS, STEAM SHOVELS, DREDGES, TRACTORS, ETC., feature it as part of their STANDARD EQUIPMENT.

It is characterized by seven important distinctive features:

Simple, Positive Sight Feeds
Separate Pump for each Feed
Separate Adjustment for each Pump
No Pressure in Sight Feed
Oil Carried to Destination by Force
Feeds Automatically
All Interior Mechanism Runs in Oil

McCord Lubricators are made in sizes and feeds to meet every possible need of force feed lubrication.

The sight feeds enable the operator to see exactly how much oil is being pumped to each bearing—just the exact quantity per stroke of the plunger.

The separate pumps, with their individual adjustment, permit of the greatest economy of oil and at the same time insure a marked increase in engine efficiency.

Years of actual service and the testimony of high grade Engineers have demonstrated that the McCord Force Feed Lubricator soon saves its cost in oil alone.

Number	1	2	3	4	5	6	7	8
Feeds—Number	1	2	1	2	3	1	2	3
Oil Capacity—Gallons	¼	¼	½	½	½	1	1	1

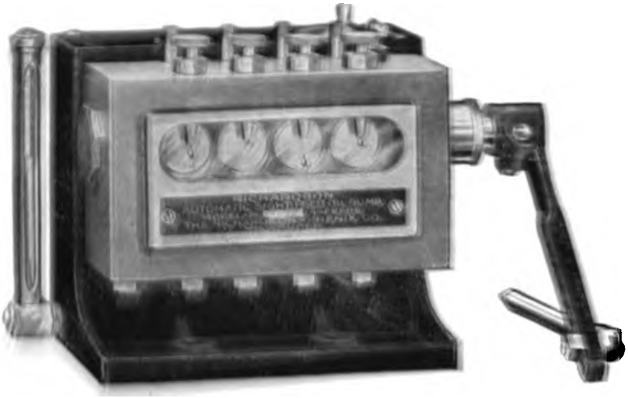
Write for Catalogue "IL."

THE RICHARDSON-PHENIX CO.

[illegible] Reservoir Ave., MILWAUKEE, WIS.

LUBRICATION ENGINEERS AND MANUFACTURERS

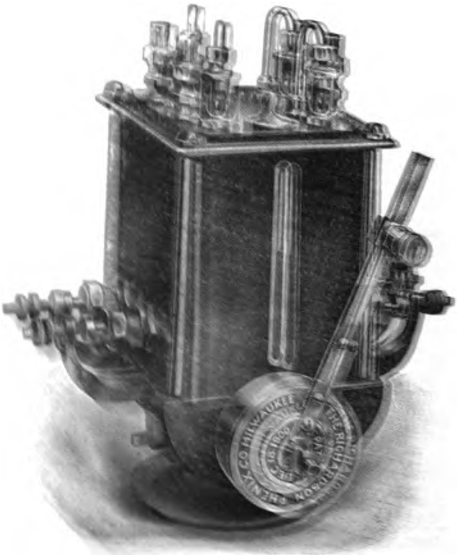
THE RICHARDSON SIGHT FEED LUBRICATOR



operates on a new principle in that it supplies the cylinder lubrication in small particles for every stroke of the engine piston. Built in sizes of from one to twenty-two feeds and if desired can be furnished subdivided to handle two or more kinds of oil. Fully illustrated and described in catalog No. A-53.

PHENIX LUBRICATOR OIL PUMPS

[illegible] are especially [illegible] for the lubrication of [illegible] all power [illegible] steam ham[illegible] [illegible] and mac[illegible] Built in sizes [illegible] to twelve feeds, square type [illegible] to two feeds, and [illegible] can be furnished subdivided [illegible] if desired [illegible] Delivers oil [illegible] pressure up to several [illegible] pounds [illegible] any [illegible] stroke [illegible] inches [illegible] length [illegible] Fully illustrated and described in catalog No. A-51.



THE RICHARDSON-PHENIX CO.

126 Reservoir Ave., MILWAUKEE, WIS.

LUBRICATION ENGINEERS AND MANUFACTURERS

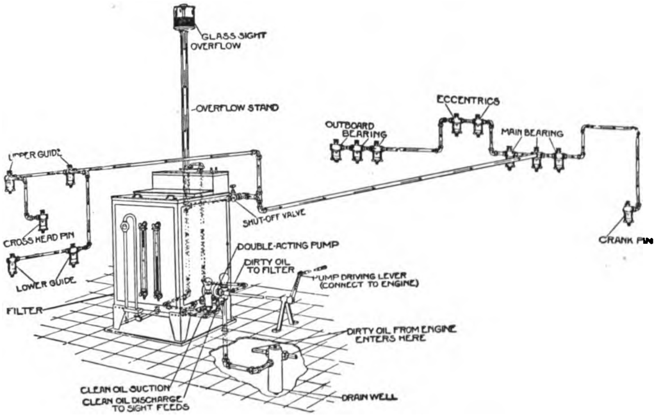
CENTRAL OILING SYSTEMS

We advise and quote on the necessary material and apparatus or design and install complete Automatic Cylinder and Bearing Lubrication Systems, in which the oil is regularly and positively supplied in just the proper quantities and, in the case of bearing lubrication, is filtered and used over and over again.

Our experience in this work, extending over a period of many years, has placed us in possession of valuable data on this subject and there is hardly a question pertaining to machinery lubrication that we have not met and solved.

We would be pleased to correspond with those interested in reducing lubrication expenses, with a view of explaining our proposition in greater detail.

INDIVIDUAL OILING SYSTEMS



Complete Richardson Individual Oiling System

RICHARDSON AND PHENIX INDIVIDUAL OILING SYSTEMS do away entirely with the necessity of installing overhead storage tanks, filters buried in the basement, or long lines of piping; starts and stops with the engine or machine to which it is applied and the entire system is always in sight of the engineer.

Salient features—low first cost, simplicity, efficiency, reliability.

Can be applied to any size and type of engine or power plant auxiliaries from 5 to 5,000 h.p. Fully illustrated and described in our 50 page Book A–55, "Scientific Lubrication of Machinery" which also contains the latest information on the application, use and selection of oils for all power plant purposes.

MADISON-KIPP LUBRICATOR CO.

MADISON, WIS.

MANUFACTURERS OF VALVELESS FORCE AND SIGHT FEED MECHANICAL LUBRICATORS.

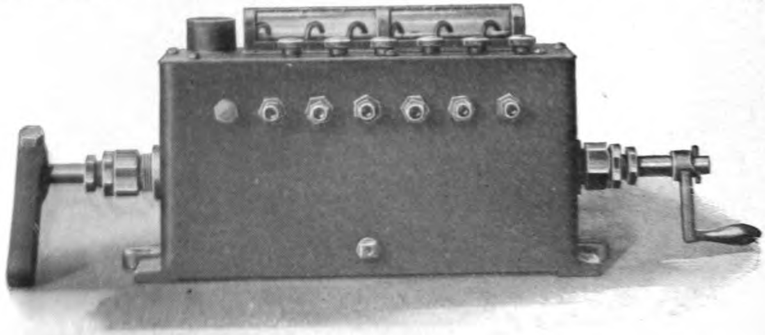
THE ORIGINAL VALVELESS LUBRICATOR

Our Guarantee.

We guarantee our Oil Pumps when properly attached to lubricate satisfactorily any engine of any size, of any make, irrespective of pressure, speed of engine, condition of oil, or skill of operator.

MODEL 30 OIL PUMP.

Our **Model 30 Oil Pump** is especially recommended for internal combustion engines. They are constructed on the **Kipp Valveless** principle, using no checks, springs or valves and will pump any kind of oil at any temperature.



Model 30—6 Feed

We have thousands of these **Oil Pumps** working in the most critical and exacting service.

STANDARD SIZES

No. of Feeds	Symbol	Oil Capacity
2	300-B	4 Pt.
3	300-C	4½ Pt.
4	300-D	5 Pt.
5	300-E	5½ Pt.
6	300-F	6⅓ Pt.
7	300-G	7 Pt.
8	300-H	7¾ Pt.
9	300-I	8½ Pt.
10	300-J	9¼ Pt.
11	300-K	10 Pt.
12	300-L	10¾ Pt.

Write for our Catalogue descriptive of Model 30 Oil Pump.

ALBANY LUBRICATING CO.

ADAM COOK'S SONS, Props.

708-710 Washington St., NEW YORK, N. Y.

ALBANY GREASE FOR THE LUBRICATION OF ALL KINDS OF MACHINERY, ESPECIALLY LUBRICATION WITH INFREQUENT ATTENTION. COOK'S LUBRICANT FOR EFFICIENT AND ECONOMICAL LUBRICATION OF GEARS OF ALL KINDS.

ALBANY GREASE

Albany Grease is a pure lubricant so compounded that it automatically maintains a film of oil between rubbing surfaces, reducing friction losses to a minimum. It contains no adulterants and is guaranteed not to oxidize, gum or corrode the metal of the bearings. Made in different consistencies to meet different temperature conditions.

SOFT NUMBERS (Nos. 0 and 1) for cold and extremely cold conditions such as outdoor use in winter.

MEDIUM NUMBERS (Nos. 2 and 3) for moderate, warm and summer weather use.

HARD NUMBERS (Nos. X, XX, XXX) for use in hot boiler and engine rooms, etc.

There is an Albany Grease to meet all needs. Tell us your requirements and we will recommend the right number.

COOK'S LUBRICANT

Cook's Lubricant is especially adapted for lubricating gears of every kind. It possesses a remarkable tenacity. No matter how fast or slowly the gears are running, a film of lubricant is always maintained between the meshing teeth.

Cook's Lubricant will not run or leak out of the gear case; it cannot be thrown off the gears by centrifugal force; it will not drip from the gears and settle in the bottom of the gear case; it cannot be cut up and packed aside by the gear teeth in action, and is not affected by changes in temperature.

Due to the wide publicity given Albany Grease and Cook's Lubricant, unscrupulous concerns occasionally substitute inferior goods for our products. When purchasing Albany Grease or Cook's Lubricant, insist that our trade mark appear on package.

Write for literature or detailed infor- covering our lubricants.

THE TEXAS COMPANY

NEW YORK AND HOUSTON

MANUFACTURERS OF LUBRICATING OILS, ENGINE AND MACHINE OILS AND GREASES. LUBRICATING OILS PREPARED ESPECIALLY FOR USE OF TURBINES, GRAVITY-FEED AND FORCE-FEED SYSTEMS UNDER ALL CONDITIONS.

In the modern power plant the question of lubrication is one of vital importance. It is a question which, affecting as it does the general efficiency of the entire plant, cannot be decided off-hand.

Before an entirely satisfactory solution is reached great care and study are required on both the part of the consumer and the manufacturer. The consumer must be careful to the utmost in his selection and employment of an oil. The manufacturer must devote himself to the study of conditions and methods of lubrication to be in a position to meet consumer requirements.

This last represents the part played by The Texas Company in the field of lubrication. A careful consideration of consumer requirements combined with our extraordinary facilities—a high class organization and excellent crudes to work with—has placed The Texas Company in a position to furnish lubricating oils that display high efficiency in checking friction and promoting economic operation.

In the larger plants lubrication is a problem carrying extra gravity, due to the severer conditions of work and it is here that the value of TEXACO LUBRICANTS is most forcibly demonstrated.

TEXACO LUBRICANTS are peculiarly fitted to meet severe conditions. They lubricate perfectly, separate readily from any water that may get into the oil through leakage and they stand up well under severe work, maintaining as high lubricating properties after a thousand hours as shown when the oil was new.

Another very essential feature that contributes to the general excellence of TEXACO LUBRICANTS is their low cold test. This is especially important in large stations where the oil is pumped from a central filtering plant to the engine. It will eliminate the shutting down of the station in cold weather on account of the oil having congealed.

The TEXACO OILS for general, rolling-mill and manufacturing plant lubrication are of such a nature that great economy will result in their use. Every requirement of lubrication, whether power economy, general plant economy, or cost can be met by TEXACO LUBRICANTS.

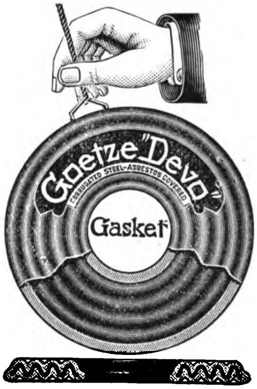
We publish a quarterly "Lubrication." It ought to contain something of interest to you. It's yours for the asking.

Address Department M. E.
17 Battery Place, N. Y. City.
THE TEXAS COMPANY.

GOETZE GASKET AND PACKING CO.

22 ALLEN AVE. NEW BRUNSWICK, N. J.

METAL GASKETS OF VARIOUS TYPES. METALLIC ENGINE PACKING. SHEET PACKING FOR FLANGES. VALVE GASKETS OR DISCS.



DEVO GASKETS

These are made of corrugated steel covered with asbestos which in turn is covered with graphite.

They are intended for use in connection with high pressure, superheated and saturated steam and other unusually severe conditions and will hold tight against extremes of pressure and temperature.

Devo Gaskets appeal to every practical engineer because they are indestructible and low in price.

Every Devo Gasket is guaranteed for five years and will be replaced within that time if found unsatisfactory.

GOETZE NO. 2 ELASTIC GASKET

A Copper-Asbestos Gasket—the copper is corrugated and the closely twisted asbestos is held in the corrugation as shown in the cut at the left.

While unlike the Goetze Devo Gasket in construction, it is also recommended for high pressures, high temperatures and the most exacting service generally.

When used for flanges, it makes a joint practically as leak proof as the pipe itself, even with the roughest, most uneven surfaces.

Guaranteed for five years and sent on 90 days' trial.

GOETZE'S VALVE GASKETS OR DISCS

These are intended for valves of the Jenkins type and are made of copper and asbestos. The illustration shows a plan and section and it will be noticed that the hole has two flat sides as common in most makes of valve discs. Th are made in the following sizes : ¼, ⅜, ½, ¾, 1, 1 1½. 2, 2½, 3, 3½, 4, 4½, 5, 6, 7, 8, 9, 10 and hes.

THE METALLIC PACKING & MFG. CO.

L. B. MARTELL, Mechanical Engineer & Gen'l Manager

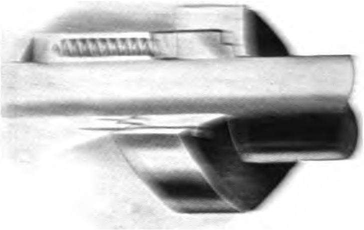
ELYRIA, OHIO

MAKERS OF MARTELL PACKINGS

MARTELL METAL PACKINGS

Martell Metal Packings embody the results of more than twenty years spent in design, manufacture, and the use of all kinds of packings. They are made to meet all conditions and are in successful use in connection with steam, gas, water, oil and chemicals of various kinds.

For steam piston rods in ordinary size and service



For Corliss valve-stems

The wearing rings are made of cast iron or bronze for piston rods and of red metal or high grade babbitt for the valve stems, all permanent parts being rigid and substantial. The illustrations herewith show two (2) of the most simple of our numerous designs. Packings are placed as conditions seem to warrant, accessibility being kept in mind at all times.

These Packings are made for rods or stems from ⅝ to 18 inches in diameter, and for plungers up to 36 inches; they are entirely self contained, and so simple that no special skill or experience is required to install. Both piston rod and valve stem Packings float freely and easily with any side motion of the rod or stem. Packing rings for Corliss stems are contained in permanent part, all of which revolves with stem.

We also manufacture the Horton Gas Engine Packing, designed and patented by Mr. James Horton, Efficiency Engineer of the Homestead Works of the Carnegie Steel Company, Pittsburg, Pa.; Twentieth Century Metal Packing Rings; Martell Metal Hydraulic Packing for outside center packed pumps; Martell Metal Hydraulic Packing for step bearing pumps, and Martell Locomotive Packing. The latter holds the mileage record on engines using superheated steam.

All Packings are strictly guaranteed and will be placed on approval.

CLEMENT RESTEIN COMPANY, INC.

PHILADELPHIA, PA., U. S. A.

BELMONT PACKING FOR STEAM, WATER, AMMONIA, HYDRAULICS, OIL, GASES, ACIDS, ETC.

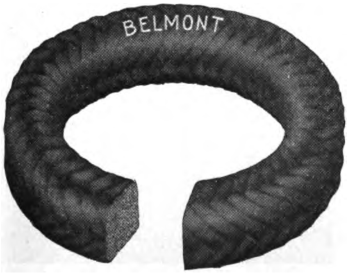
BELMONT HOLLOW CENTER PACKING.

Belmont Hollow Center Packing. Style No. 19

Belmont Hollow Center Packing, Style No. 19, a ring of which is here shown, has several important advantages over all solid packings of either the square, round or wedge construction. In removing the old style "rubber core" and making this material with a hollow center the manufacturers have achieved remarkable results First, *having a hollow center*, it weighs much less than the solid packings, and price per pound being the same, the cost for packing a given rod or plunger is much less. More important than this, however, is the fact that the hole provides a place for all excessive expansion or swelling, with the result that there positively can be no more friction on the rod or plunger than is necessary to withstand the initial pressure. Nor can it become tight enough on the rod or plunger at any time either from undue gland pressure or swelling to run hot and "burn."

It is recommended for **steam, ammonia and oils, for elevator plungers, hot and cold water pumps** and all conditions of hydraulic service where a stuffing-box packing is required. It is particularly efficient on **outside packed boiler-feed pumps for hot water** where much trouble is experienced with solid packings on account of excessive swellings. Try it. Your initial trial order will be filled with a positive guarantee to give you satisfaction or no pay. May we have a trial order under these conditions? Booklet illustrating and fully describing Belmont Hollow Center Packing for the asking.

BELMONT BRAIDED SUPERHEAT STEAM PACKING.



Belmont Braided Superheat Steam Packing. Style No. 751

Particular attention is invited to our **Belmont Braided Superheat Steam Packing, Style No. 751.** Unexcelled for all conditions of Superheated Steam and particularly recommended for **Gas and Marine Engines, Air Compressors, Hot Air Blasts** and every other service requiring a packing **for extreme high temperature and high speed.**

In process of manufacture each strand of asbestos cord is thoroughly impregnated with finely prepared lubricating graphite in conjunction with our special heat-resisting compound. The required number of strands for the various sizes of packing are braided into a solid piece and when placed in the stuffing-box will not blow out for the reason that **as the packing is worn away by the rod each separate strand takes its wear endwise to the rod.** It positively will not harden in service, and for this reason extra rings may be added from time to time as required without removing the rings in service.

BELMONT COMBINATION STEAM PACKING, STYLE No. 756.

A combination of **Belmont Styles No. 19 Hollow Center Packing and No. 751 Superheat Steam Packing** for steam pressures up to 150 pounds.

The Hollow Center Packing used in combination with our Superheat Steam Packing makes it subject to control at all times and lubricates the wearing parts.

Made for packing space ⅜ inch or larger.

THE B. F. GOODRICH COMPANY

AKRON, OHIO

Offices in all principal cities

MANUFACTURERS OF MECHANICAL RUBBER GOODS, TIRES, ETC.

HOSE

WATER HOSE covers a wide range of usage, making it quite out of the question to advance any specific recommendations as to quality.

"WHITE ANCHOR" and "AKRON"—special grades for unusual conditions of service.

"TRITON," "CASCADE," "DELUGE,"—regular grades for all general purposes. Braided fabric water hose—in either smooth or corrugated cover.

STEAM HOSE must be heavily constructed to stand the pressure, and the inner lining must be so compounded as to resist the action of steam under varying temperatures.

"GOODRICH"—for high pressure. This is truly a long-life hose.

Special coverings for steam hose: Red Painted woven cotton cover, Woven Marlin Cover, Asbestos Wire-Wrapped cover.

PNEUMATIC HOSE wrapped duck—50′ length style:

"GOODRICH"-the highest quality for the hardest service.

"AKRON" the standard hose, for all general purposes.

Wire wrapped pneumatic tool hose.

BRAIDED-FABRIC PNEUMATIC HOSE—smooth or corrugated.

AIR DRILL HOSE is heavily constructed throughout with a layer of canvas on the outside as a protection against cuts and abrasions.

"GOODRICH" exceptionally high quality, unequalled for wear.

"QUARRY" our standard grade and biggest seller.

BOILER WASHOUT HOSE is made in extra heavy weight to withstand the rough service it encounters. We advocate our heavy "Boiler Washout Hose" for turbine tube cleaner work. Made in two grades, "Goodrich" and "Akron."

SUCTION HOSE is made in a variety of grades to suit any purpose, either smooth or rough bore style.

DREDGING SLEEVES, OIL SUCTION HOSE, OIL WELL DRILLERS' HOSE, OIL CONDUCTING HOSE, GASOLINE HOSE, SAND BLAST HOSE, COKE HOSE, MARINE DECK HOSE, all especially adapted to the purposes for which they are made.

PACKING

RED SHEET PACKING an excellent product, in two grades.

RED SHEET BRASS WIRE INSERTED in the same grades.

DIAPHRAGM AND CLOTH INSERTION: Packing highly recommended for their proper uses.

SUPER HEAT PACKING, a combination of rubber and asbestos, especially adapted for high pressures.

RED TUBULAR GASKET PACKING, SPIRAL SQUARE DUCK PACKING, ROUND AND SQUARE DUCK PACKING, SQUARE RUBBER BACK, ROUND PISTON PACKING, AND PURE GUM STRIPS all made to supply the demand for these various kinds.

RUBBER GASKETS

All grades and shapes. No matter what your requirements may be, we can supply them

RUBBER PUMP VALVES

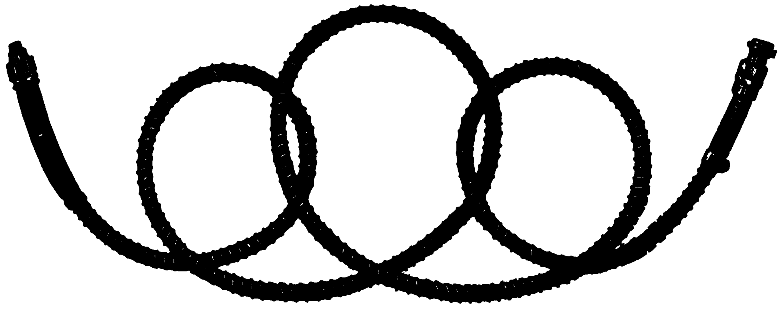
There is no class of our product which we take greater pride in stamping with the GOODRICH trade mark. Our list of grades is complete; we are always glad to give special attention to unusual conditions.

Made in grey or red rubber.

THE AMERICAN METAL HOSE CO.

WATERBURY, CONN.

MANUFACTURERS OF FLEXIBLE METAL HOSE AND TUBING FOR STEAM, OIL, AIR, GAS, WATER, ETC.



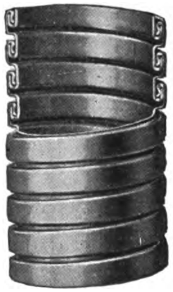
25-foot length 1-inch BD20 Bronze Steam Hose, with packed couplings, re-enforced ends, and one end asbestos and canvas covered.

AMERICAN FLEXIBLE METAL HOSE is particularly adapted to conveying Oil and Steam, both of which quickly attack and destroy Rubber Hose. Our Hose is as strong in construction as is consistent with flexibility, will stand high pressures, and for conveying either of the above agents is most practical and economical. For both of the above purposes an Interlocked Hose is supplied, which is made from a continuous metal ribbon or strip wound spirally over itself, the edges being crimped or turned in during the winding to form the Interlocked Joint shown in illustration; a specially prepared asbestos cord fed into a separate groove in the strip during the winding acting as a packing and making the Hose tight.

For STEAM, our Standard is the Bare Interlocked Pattern, BD15 BRONZE HOSE with I. P. T. Brass Couplings attached. These Couplings are threaded internally to screw onto the spiral groove on the outside of the Hose and are packed on with a stuffing box of asbestos and red lead, making a tight connection. Each coupling is provided with a Flexible Metal re-enforced end which is fastened under a shoulder prepared for it on the Coupling and extends a short distance from the Coupling over the end of the Hose, giving a double thickness of metal at the point where there is the greatest strain.

FLEXIBLE STEEL HOSE, Style BD15 is admirably adapted to conveying Oils, its life being actually prolonged by contact with them. The smaller sizes are used in numberless connections, the principal one being for Oil Feed purposes on machinery. The larger sizes are used extensively in unloading and barrel filling work. Couplings for Oil Hose are generally sweat on.

While the Bare Interlocked Hose, Style BD15, is suitable for ordinary work and pressures, there are instances, when the Hose is subjected to constant handling, where a stronger type is required. To meet this demand we supply our BD20 Hose, which is covered with a braiding of fine BRONZE or STEEL Wire and a Spiral Armor Wire. This covering does not affect the flexibility of the Hose, but is most efficient as a protection where hard usage is unavoidable, and by reason of its greater strength makes the Hose suitable for higher pressures.



Interlocking Construction B. D. 15 Hose

SIZES

We carry BD15 and BD20 HOSE in stock, both in STEEL and BRONZE in the following sizes: 3/16", 1/4", 5/16", 3/8", 1/2", 3/4", 1", 1 1/4", 1 1/2", 2", 2 1/2", and 3" internal diameter. Larger sizes furnished on order.

Full information on our FLEXIBLE METAL AIR and WATER HOSE and GAS TUBING, or on Special Hose for extreme pressures, furnished on application

THE A. & F. BROWN CO.

[illegible] STREET, NEW YORK CITY

WORKS: ELIZABETHPORT, N. J.

ENGINEERS, FOUNDERS, MACHINISTS AND MILLWRIGHTS. MANUFACTURERS OF GEARS OF ALL DESCRIPTIONS, TURNED STEEL SHAFTING, PULLEYS, SPLIT PULLEYS, FRICTION CLUTCHES, SPECIAL MACHINERY, ETC.

CUT GEARS

These gears are cut on the best [illegible] automatic machines [illegible] this department [illegible] to turn out [illegible] gears of every description [illegible].

MACHINE MOULDED GEARS

The Gear Department of our [illegible]

FRICTION CLUTCHES

[illegible] simple, compact [illegible] liable to get out of [illegible] thrown "in gear" [illegible] the large [illegible] operating device which [illegible] right and left [illegible]

SHEAVES

[illegible] rope-house [illegible] many steam- [illegible] and large [illegible]

[illegible] MILL

[illegible] has been [illegible]

SPECIAL MACHINERY

[illegible] special machinery [illegible] machine [illegible] equipment of [illegible] requiring [illegible]

[illegible]

FALLS CLUTCH & MACHINERY CO.

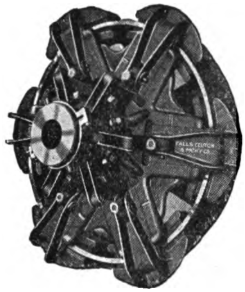
CUYAHOGA FALLS, OHIO

NEW YORK
206-208 Fulton Street

BOSTON
52-54 Purchase Street

CINCINNATI
134 W. Second Street

PULLEYS, SHAFTING, HANGERS, PILLOW BLOCKS, COUPLINGS, COLLARS, FRICTION CLUTCH PULLEYS, FRICTION CLUTCH COUPLINGS, AND ALL OTHER POWER TRANSMITTING MACHINERY.

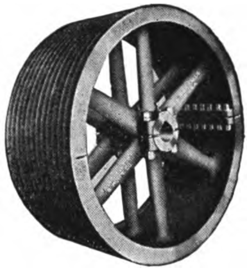


FALLS FRICTION CLUTCH COUPLINGS, PULLEYS, GEARS AND ROPE SHEAVES

Gripping shoes being wood are easily replaced. Parts interchangeable, simplicity of adjustment, made for twenty years, thoroughly tried out. Friction clutch pulleys with interchangeable babbitted or bronze lined sleeves. All parts accessible. High starting torque.

There is absolutely no contact of frictional surfaces when not "in clutch." All our clutch pulleys are furnished with split cast sleeves for bearings, which are babbitted with the best quality of metal, turned on the outside to fit the hub of the pulley and bored on the inside to fit the shaft, thus making a very complete bearing. The sleeves are held in position by means of two cap screws, and when the babbitt is worn they can be readily taken out, rebabbitted and placed in position again without removing the pulley from the shaft.

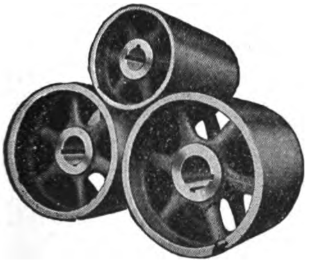
FALLS SYSTEM OF ROPE TRANSMISSION



Owing to the flexibility of rope transmission, it has been generally recognized by engineers to be the best mechanical means of power distribution. A few of the many advantages are that the location and position of driving shaft from driven shaft does in no way prevent the use of same; the amount of power being unlimited; economy in first cost and maintenance being the initial features.

Other features equally important: steady running, noiseless, without electrical disturbance, and no loss of power by slipping. Power may be transmitted with rope by two distinct methods: as by the multiple or English system, and by the continuous or American system.

We supply complete equipment, including sheave wheels, tension carriages, etc., and will design and estimate for any contemplated installation.



PULLEYS

Are made from close Grey Cast Iron, either solid or split, for single and double belts, turned true and accurately balanced.

SHAFTING AND BEARINGS

Hammered Forgings for Shafting purposes.

Complete line of Heavy Rigid and Ring-Oiling Pillow Blocks and Base Plates for extra heavy and severe duty.

[illegible]

[illegible] HERRINGBONE [illegible]

[illegible] GEARS

[illegible]

[illegible] maximum [illegible] width [illegible] continuity [illegible] using [illegible] very few [illegible].

[illegible] distinctive features—

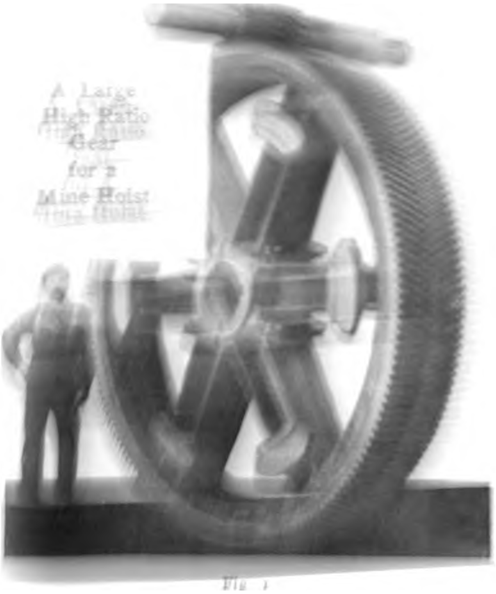
[illegible] attainable [illegible]

[illegible] section.

[illegible] spiral angle.

[illegible] interchangeability.

[illegible] efficiency in both directions.



A Large High Ratio Gear for a Mine Hoist

Fig. 1

[illegible] smooth, continuous action without [illegible] of vibration.

[illegible] ratios. In this connection [illegible] their shafts. Ratios of [illegible] necessary. Where gears [illegible] type. Special gears [illegible] speeds up to 7,000 feet [illegible]

[illegible] gear for mine hoist. Fig. 2 [illegible] application of high ratio [illegible] triplex pump. Fig. 3 is a [illegible] turbine gear [illegible]

THE FALK COMPANY

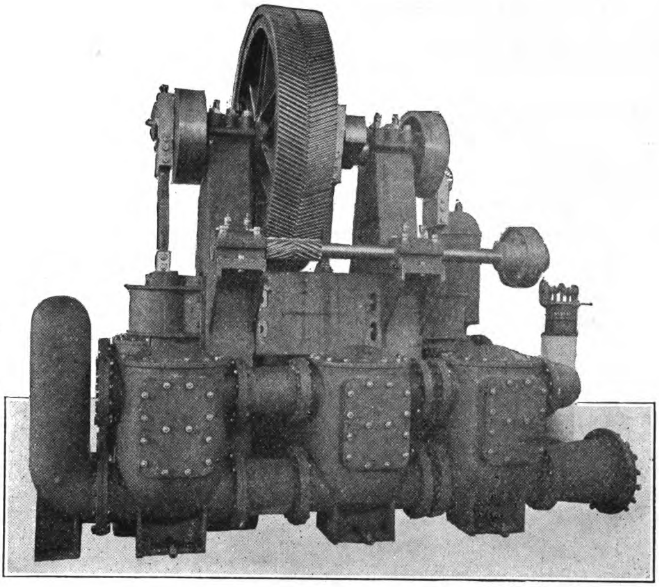


Fig. 2

SPECIAL ADVANTAGES

Long life.

High efficiency (loss never exceeds 1% at rated load).

Elimination of countershafts and double-gear trains.

Absence of vibration with prevention of shaft crystallization and breakdown of motor insulation.

Quiet action with durable steel pinions.

The range of application for Wuest herringbone gears covers every case where spur gears are used and many new fields where spur gears are impossible.

Specially adapted for

- Marine Steam Turbines.
- Turbo-Generators.
- Turbine-driven centrifugal pumps, mills and shafting.
- Rolling Mills and Rod Mills.
- Tube Mills and Crushing Plant.
- Power Pumps.
- Air Compressors and Blowers.
- Hoisting, Elevating and Conveying Plant.
- Rubber Machinery.
- Machine Tools.

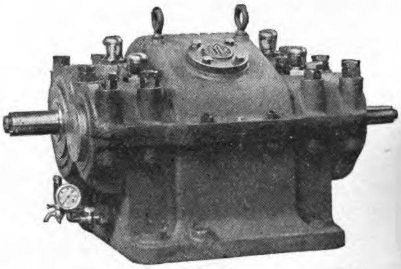


Fig. 3

THE FALK COMPANY

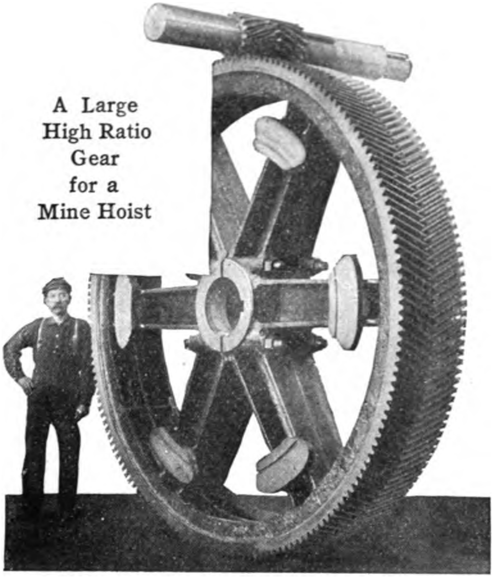
MILWAUKEE, WISCONSIN

MANUFACTURERS OF PRECISION HERRINGBONE GEARS WITH STAGGERED TEETH (WUEST PATENTS)

WUEST HERRINGBONE GEARS

We manufacture a complete interchangeable system of herringbone gears, with teeth generated on special machines, designed and built exclusively for our own use.

The gears which we produce are hobbed, both sides at once, in solid blanks.



A Large High Ratio Gear for a Mine Hoist

Fig. 1

The Wuest System of staggered teeth, besides giving the maximum contact surface for a given width of face, is invaluable in securing unbroken continuity of engagement when using high ratio pinions with very few teeth.

Other distinctive features:—

- Highest attainable accuracy.
- Involute tooth form on *circumferential* section.
- Invariable spiral angle.
- Perfect interchangeability.
- Equal efficiency in both directions.

Wuest herringbone gears transmit power by smooth, continuous action without jar, shock or vibration.

They are almost noiseless.

They can be used for extremely high *single* gear ratios. In this connection we make a specialty of forged pinions in one piece with their shafts. Ratios of 15 to 1 are quite normal and 20 to 1 may be used when necessary. Wuest gears can be run with safety at far higher velocities than the spur type. Special gears for use in connection with steam turbines are suitable for speeds up to 7000 feet per minute.

Referring to illustrations, Fig. 1 shows a large high ratio gear for mine hois
Fig. 2 shows an application of high ratio gears for a large vertical triplex p
Fig. 3 is a standard turbine gear unit forced lubrication type.

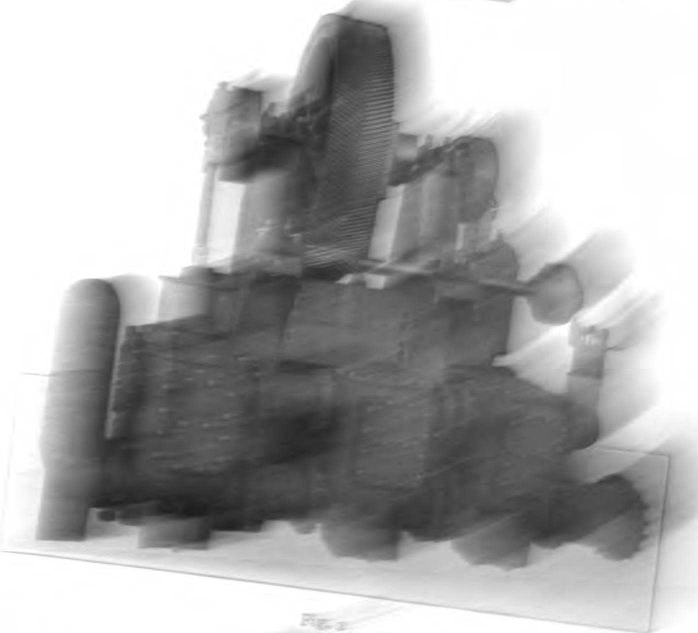


Fig. 2

SPECIAL ADVANTAGES

Long life.

High efficiency (loss never exceeds 1% at rated load).

Elimination of countershafts and double-gear trains.

Absence of vibration with prevention of shaft crystallization and breakdown of motor insulation.

Quiet action with durable steel pinions.

The range of application for Wuest herringbone gears covers every case where spur gears are used and many new fields where spur gears are impossible.

Specially adapted for

rine Steam Turbines.
rbo-Generators.
rbine-driven countershaft
ts and shafting.
lling Mills and Ro
le Mills and C
e Pumps.
Compress
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NORDYKE & MARMON CO.

Established 1851

1320 KENTUCKY AVE. INDIANAPOLIS, I

FLOUR AND CEREAL MILLING MACHINERY; ELEVATING, CON ING AND POWER TRANSMITTING APPLIANCES.

FLOUR AND CEREAL MILLING MACHINERY

Aspirators
Bag Filling Machines
Barley Machinery
Blenders, Flour
Bolters, Flour, Meal and Special products
Buckwheat Machinery
Cleaners, Corn and Grain
Conveyors
Coolers, Meal
Crushers, Corn
Degerminators, Corn
Distillery Machinery
Dressers, Flour
Dryers, Meal
Dumps, Wagon
Dusters, Bran
Fans, Exhaust or Ventilating
Flour Mill Machinery, "All Kinds"
Grain Cleaning and Grading Machinery
Grain Elevator Machinery & Appliances
Heaters, Grain
Hullers, Rice
Mill and Factory Supplies

THE RIPE EXPERIENCE of more than sixty years of successful manufacturing is embodied in every machine and mill or factory accessory produced by Nordyke & Marmon Company. In every way that counts for the user's benefit they are second to none.

Each new device and machine is subjected to a gruelling test under actual operating conditions before it goes on its way to a prospective user. It is this rigid standard of service and responsibility to the ultimate user that has made Nordyke & Marmon Company known the world over as "America's Leading Mill Builders."

The list shown above gives you an idea of the different machines we build for your use. Our catalogs tell you in further detail why these machines fulfill your requirements so thoroughly. A letter will bring a catalog describing any machine you need—write it now.

Mills, Buhr Stone
Mills, Feed Grindi
Mills, Roller
Movers, Car
Oat Meal Machin
Packers, Bran
Feed, Flour & Me
Power Transmittin Machinery
Pulverizing Machi
Purifiers, Flour &
Reels, Bolting
Roll Grinding and rugating
Rope Transmission chinery
Scalpers, Corn (Ro Reel and Hexag
Screening Machine
Separators, Dust
Shellers (Corn), H and Power
Sieve, Starch
Sifters, Flour, etc.
Starch Factory chinery
Steamers, Grain
Take-ups, Belt &
Temperers, Corn Grain

NORDYKE & MARMON CO.

ELEVATING, CONVEYING AND POWER TRANSMITTING APPLIANCES

[illegible]

Chain, sprocket
Clutches, friction, jaw
Cogs, wood
Collars, safety set
Conveyors, belt, flight, helicoid, spiral
Countershafts, variable speed
Couplings, clamp, one, compression, conveyor, finger, flange, friction clutch, jaw clutch plate
Cups, elevator
Elevators
Frames, sectional wall
Gears, bevel, spur, mitre, internal
Hangers, conveyor, drop, post
Hardwood conveyor flights
Heads, elevator, galvanized iron, sprinkler, standard
Hoisting

Rack tighteners
Rolls, belt conveyor
Rope, Manila transmis
Rope sheaves
Rope, wire
rollers
Set screws
Shafting
Sheaves, rope, rubber
Speed indicators
Stands, floor, pulley
Take-up boxes
Tension carriages
Tighteners, belt
Tracks for tension carri
Triple conveyor bearin
Troughing rolls and car
Vertical shaft bearings
W

Ring Oiling Bearing

Plate Type Coupling

Adjustable Ball and Socket Drop Hangers

Horizontal Tension Carriage Double Track

Finished Iron Sheaves for Manila Rope Transmission

Screw Belt Tightener Horizontal and Vertical

Bevel Mortise Gearing

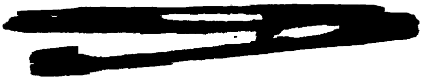
Mitre Gearing

T. B. WOOD'S SONS COMPANY

CHAMBERSBURG, PA.

MANUFACTURING ENGINEERS, POWER TRANSMISSION MACHINERY

SHAFTING



[illegible] Keyseats

[illegible] is made of the best [illegible] perfectly round and straight [illegible] that insure easy running [illegible] minimum loss of power. [illegible] are prepared to furnish [illegible] diameters up to 24 inches.

SAFETY SET COLLARS

[illegible] or split for all [illegible] over and fitted [illegible] the illustra- [illegible] bolts and set [illegible] projecting [illegible]

[illegible] Fast Collars; [illegible] bored slightly [illegible] shaft. The turning [illegible] is shrunk [illegible] true running collar.

COUPLINGS

[illegible] Compression Coupling

[illegible] Plate Couplings [illegible] Type or [illegible] Double Cone Compression Couplings, [illegible] Collins Compression Couplings, [illegible] Giant Compression, the coupling that requires no [illegible] Compression Couplings; Ring Compression Couplings, [illegible] Jaw Clutch Couplings, Solid Sleeve Couplings and Universal Joint Couplings.

HANGERS

Hanger

[illegible] have adopted the Ring Oiling Bearing as the [illegible] Hangers, we can supply Plain Bearing [illegible] and the Chain Oiling Type. The Ring [illegible] in our Double Collar End. [illegible] Fast Collar, and Closed [illegible] line of Hangers includes [illegible] Ball and Socket for Head- [illegible] Ball and Socket regular [illegible] Adjustable, Post [illegible] Clamps and [illegible] here.

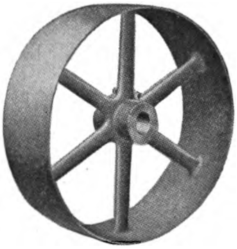
PILLOW BLOCKS, ETC.

[illegible] Vertical Shaft [illegible] Rigid, Rigid [illegible] Blocks; [illegible] Standard Rigid [illegible] and [illegible] Ball [illegible] Heavy Ball [illegible] Sleeves.

T. B. WOOD'S SONS COMPANY

PULLEYS

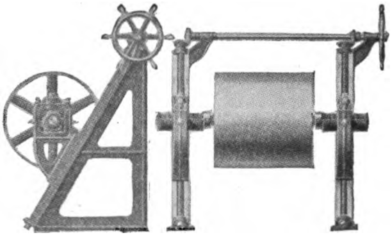
We manufacture Cast Iron Pulleys only, believing that they are superior to others because they are permanent and are suited to a wider range of service than any other type of pulley. The line comprises Plain, Split, Large Bore, Clamp Hub, Tight and Loose, Fly Wheels, Split Arm, Cork Insert, Step Cone, Taper Cone, Pulley Bushings, Stationary and Adjustable Mule Pulley Stands, Single and Double Brace Binder Frames, and Guide Pulleys.



Pulley

BELT TIGHTENERS

The upright design has triangular shaped sides, Style A has pulley and bearings set as shown in the illustration, and while in Style B these are fitted to the vertical side of the frame, Style C is a post or wall pattern. We also make Horizontal and Rack and Pinion Belt Tighteners.

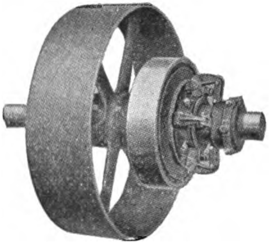


Belt Tightener

UNIVERSAL GIANT FRICTION CLUTCH WITH EXTENDED SLEEVE

This clutch is made with an extended sleeve of standard diameter, so that an ordinary pulley, gear, rope sheave or sprocket can be used by simply keying it on sleeve of clutch. It is only necessary that the bore be same as diameter of sleeve, just as if bored to fit a line shaft. This feature eliminates the expense and delay of making up special pulleys, as is usually required.

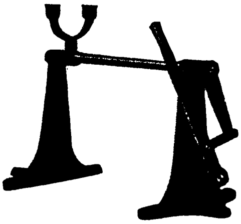
The Universal Giant Friction Clutch is designed so that the outer rim covers and protects the friction surfaces from dust, dirt, or any foreign substance. The life of all wearing parts is thus greatly prolonged and the clutch is made especially valuable for use in cement mills, phosphate factories, elevators, or any place where dust or gritty substances are afloat in the air.



Universal Friction Clutch Pulley

SHIFTERS, ETC.

We have a type which permits attaching to any of our hangers; also Fork and Lever Stands, Compound Lever, Worm Geared, Single Spur Geared and Double Spur Geared, Shifter Stands.

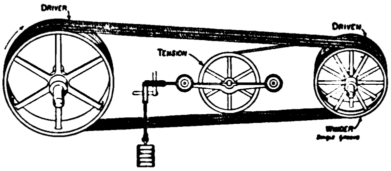


Compound Lever Shifter Stand

ROPE TRANSMISSION

We are prepared to make complete installations in either the English or American system and also furnish Rope Sheaves in various styles, Tension Carriages; Track and Track Hangers.

We have at your command engineers who have had years of experience in rope driving, and whom we will be glad to have plan a drive to meet conditions as they may exist.



Rope Drive

THE HILL CLUTCH CO.

CLEVELAND

[illegible]

A COMPLETE LINE OF POWER TRANSMISSION MACHINERY FOR MILL AND ROPE DRIVES, INCLUDING THE WELL KNOWN PATENTED HILL FRICTION CLUTCH (SMITH TYPE) AND COLLAR OILING BEARINGS

HILL FRICTION CLUTCHES

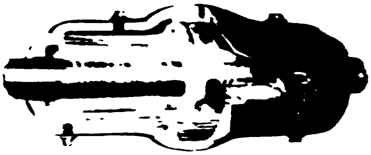
(Smith Type)

The new Smith Type of Hill Clutch is the result of twenty-nine years' experience in manufacturing Friction Clutches.

All working parts are removable without disturbing shaft, hub or pulley. Friction surfaces are positively disengaged. No springs. [illegible]—requires no troublesome [illegible] in ring hub to align [illegible] mechanism made of steel and forgings.

Built solid or split.

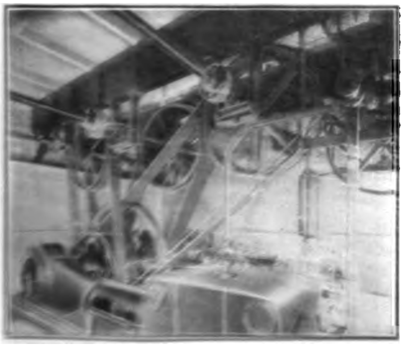
HILL COLLAR OILING BEARINGS



Hill Collar Oiling Bearings minimize power losses. Instead of depending upon a loose ring or chain for conveying oil to the journal, a fixed collar is employed.

Oil stored in large reservoirs in bottom of the bearing is continuously and positively elevated to the top reservoirs, and then flows by gravity over the entire bearing surface.

Heavy, split oil collar clamped to the shaft also acts as a thrust collar, eliminating the necessity of outside shaft collars except in case of very severe end thrust.



HILL ROPE DRIVES

American and English System Rope Drives designed, built and installed.

Our nineteen years' experience enables us to recommend the best method of installing each individual drive to meet customers' requirements.

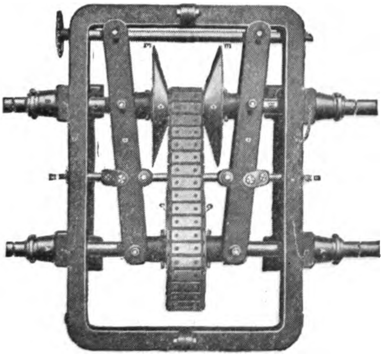
Preliminary information gladly offered free of charge to all contemplating the installation of new drives or changes in their present system.

REEVES PULLEY COMPANY

COLUMBUS, IND.

Branch House: Clinton and Monroe Sts., Chicago

"THE REEVES" PATENT VARIABLE SPEED TRANSMISSION, PATENT WOOD-SPLIT PULLEYS, PATENT WOOD-SPLIT PULLEY CLUTCH; POWER TRANSMISSION APPLIANCES



"The Reeves"
Variable Speed Transmission

"The Reeves"
Wood-Split Pulley

"THE REEVES" VARIABLE SPEED TRANSMISSION

Construction and Operation. The essential feature is that two pairs of cone disks are spline mounted on two parallel shafts. These disks are operated by a pivoted bar which is operated by a screw in such manner that one pair of disks is brought together while the other pair is forced an equal distance apart. At the same time a uniform tension of the special belt is maintained. Efficiency from 80% to 95%, according to conditions of the service.

The inner sides or faces of the disks form a V-shaped groove into which is fitted an especially designed belt, having its bearing surface on the edges instead of the bottom, as with an ordinary belt.

One set of disks acts as driver and the other driven. As the disks are actuated so the belt assumes the large diameter on one pair of disks, it at the same time assumes the small diameter on the opposite pair, thus increasing or diminishing the speed of the driven shaft, and giving any speed between the two extremes of variation.

Installation. "The Reeves" Variable Speed Transmission is installed in the same manner as an ordinary countershaft and may be placed on the floor or suspended from the ceiling as desired.

Application. It may be applied to any machine or mechanical device whatever requiring variable speed, such as Iron Working Tools, Canning Machinery, Packing Machinery, Bakers' Machinery, Laundry Machines, Textile Machinery, Veneer Cutters, Dryers, Cement Machinery, Paper Making Machinery, etc.

Sizes. Made in sizes from 2 H.P. to 150 H.P. Speed Variation as great as ten to one, or less as required.

Catalogue on request.

"THE REEVES" WOOD-SPLIT PULLEY

"The Reeves" Wood-Split Pulleys are made in all sizes up to 30 ft. diamete Being fitted with interchangeable bushings they may be changed from one sha to another of different size at an expense of a few cents for a new bushing.

Stocks carried in all jobbing centers.

Catalogue on request.

THE AMERICAN PULLEY COMPANY

4200 Wissahickon Ave., PHILADELPHIA

Cor. Grand & Green Sts.
New York

165 Pearl Street
Boston

[illegible] S. [illegible] St.
Chicago

MANUFACTURERS OF "AMERICAN" STEEL SPLIT PULLEYS

(Patented)
3", 4" AND 5" DIAMETERS
Note the sturdy construction. These [illegible] as perfect [illegible] American pulleys. No [illegible] steel.

(Patented)
INTERMEDIATE SIZES
Provided with grooved air escape. Six flat [illegible] arms [illegible] give great rigidity and least air resistance. [illegible] the ends of the arms to inner flange [illegible] a [illegible] pulley, strong where strength is needed.

(Patented)
44" TO 60" DIAMETERS
Grooved air escape. The hub shell is solidly riveted to half an annular hub ring of angle section. Eight arms, bifurcated at the base, are riveted through lapping bifurcations to an annular hub ring.

"AMERICAN"
STEEL SPLIT PULLEYS

Although so light, "American" steel pulleys are the strongest and the best for belt holding. This has been determined by thorough tests.

Each new size or style of "American" pulley must undergo a trial in our testing room, much more severe than it could meet under ordinary working conditions.

"American" pulleys are compared, in our tests, with corresponding sizes of other makes. If the "American" does not show up *better* than the others, it is *not good enough* and the model must be improved.

These tests have proved conclusively that "American" pulleys will stand up under a greater strain than other pulleys having much more weight.

"American" pulleys may be installed without stripping the shaft. Interchangeable bushings provided with a special interlocking device, give them an immovable grip on different sizes of shafting, thus eliminating any necessity for key-way or set screw.

The present day "American" pulley is an improved form of the original "American," the first successful pulley to be made of steel, and which embraced so many basic principles of correct steel pulley construction, that other steel pulley makers have been unable to approach it for simplicity and correctness of design.

Every "American" steel split pulley is guaranteed to perform double belt duty under any conditions not requiring a special pulley.

Instructive printed matter mailed on request.

THE AMERICAN PULLEY COMPANY

4200 Wissahickon Ave., PHILADELPHIA

Cor. Grand & Green Sts.
New York

165 Pearl Street
Boston

124 S. Clinton St.
Chicago

MANUFACTURERS OF "AMERICAN" STEEL SPLIT PULLEYS

STRUCTURAL FEATURES

Tight clamping hub eliminates key-way and set screws. Fits different shafts by use of interchangeable bushings, which are immovably fixed by interlocking device.

No need to strip the shaft. Fit two halves of pulley together, then tighten clamping bolts evenly.

Rolled bead on rim strengthens face at edge.

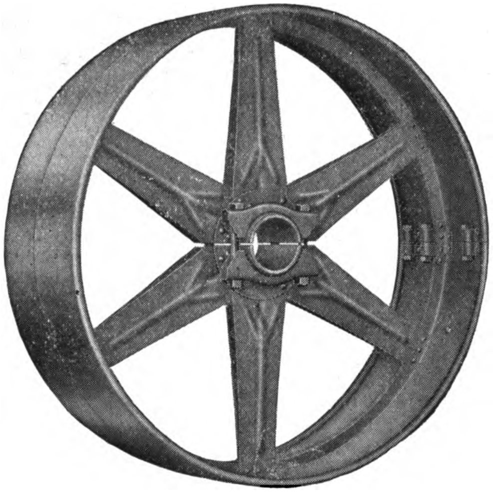
Inside flange, to which ends of arms are riveted, secures extraordinary strength and trueness.

Flat "A"-braced arms (edge on) give perfect rigidity and least air resistance.

Grooved air escape provides perfect belt contact without weakening the face.

Rivets do not go through face. Thus rivet heads can't be worn away by belt.

Rim: One thickness of steel, snugly doweled at the joints. Combines lightness with durability.



Patented

"American" Steel Split Pulleys represent the first successful use of steel as a pulley material. Their inventor, as was his right, patented many of the *fundamental* principles of steel pulley construction. The result is—"American" pulleys are built along lines which for simplicity and correct design have not been equaled.

More "American" pulleys are put into use annually than any other make of metal pulley, and less than 2/10 of one per cent. have failed, in any way, to fulfill our guarantee of double belt service under any conditions not demanding a special pulley.

There are "American" dealers almost everywhere.

Send for instructive printed matter.

SAGINAW MANUFACTURING COMPANY

SAGINAW, MICH.

MANUFACTURERS OF THE GILBERT WOOD SPLIT PULLEYS

STYLE C PULLEY

All of our pulleys are made of thoroughly seasoned maple, and finished with two coats of varnish. Pulleys of this style are bolted together, the nuts on the clamping bolts being [illegible] with [illegible] blocks which cannot get out of place [illegible]

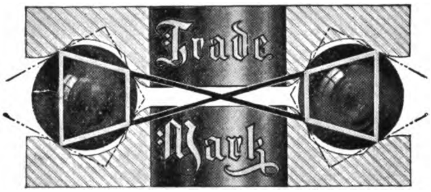
[illegible]

[illegible]

AUBURN BALL BEARING COMPANY

22 Elizabeth Street, ROCHESTER, N. Y.

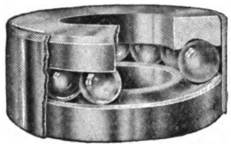
AUBURN BALL THRUST BEARINGS; AUBURN COMBINATION THRUST AND ANNULAR BALL BEARINGS; AUBURN STEEL, BRASS, AND BRONZE BALLS.



Auburn Ball Thrust Bearings are especially adapted for High Speeds and Heavy Loads in a small space due to Auburn Patented Four Point Contact Cone Principle, illustrated by the trade mark. Specially selected tool steels properly hardened through and through in the balls and races, together with careful grinding and polishing, make Auburn Bearings most durable.

Auburn Ball Thrust Bearings are used extensively for Boring, Drilling, Milling and Screw Machinery; Lathes, Elevators and Jacks; Hydraulic and all Transmission Machinery wherever the thrust of a rotating part is to be taken care of.

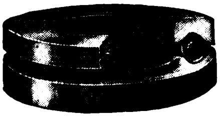
AUBURN STYLE T-100 BALL THRUST BEARING



Auburn Style T-100 bearing is a self contained ball thrust bearing. The outside retaining sleeve is attached to the lower race of the bearing with the upper race free to rotate, yet held in place. This sleeve furnishes a protection to the balls from dust and dirt, as well as making the bearing a unit. This feature greatly facilitates the assembling of the bearing on the machine and does away with the loss of balls in transit and during the operation of installing. It is a style for use in exposed places where some protection to the bearing is desired.

AUBURN STYLE T-114 BALL THRUST BEARING

Where there is a housing to protect the bearing this Auburn Style T-114 is desirable. It is also self-contained and a unit with the advantage of easy assembling on the machine. The retaining sleeve is attached to the bore of one race, leaving the other free to rotate, yet holding same in position. This is a style to use where a good circulation of oil must be had.

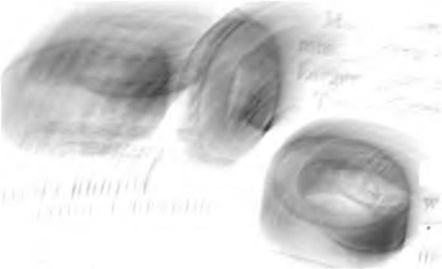


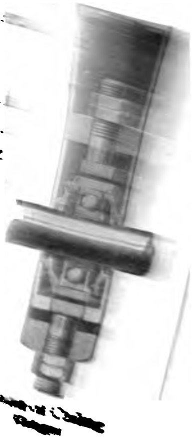
Auburn Ball Thrust Bearings are carried in stock for immediate shipment covering a range of shafts up to five inches in diameter, in light and heavy types. Larger sizes up to 26 inches outside diameter can be furnished promptly.

Bearings specially designed to meet unusual conditions of service can be made promptly. Write for bulletin.

WASHERS, RACES, DISCS AND RINGS

of tool steel, hardened and ground, made to customer's specifications. Our excellent facilities insure high grade work. Send Blue-Prints of sizes today for quotation.





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THE NEW DEPARTURE MFG. CO.

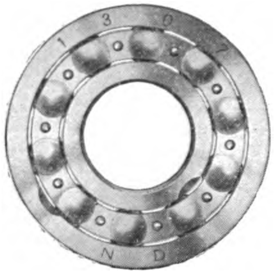
Factory Equipment Dep't., Hartford Div.
Hartford, Conn.

Main Office and Works, BRISTOL, CONN.

BALL BEARINGS AND BALL BEARING SHAFT HANGERS

NEW DEPARTURE BALL BEARINGS

The quality of this American-made bearing has been proved by its successful use in 80 per cent. of American-made motor cars. New Departure ball bearings are made in three types; to wit, Double Row or double purpose bearing, sustaining loads from any and all directions with equal efficiency; Single Row, a bearing sustaining radial loads only; Radax, a high-grade, cup and cone type, sustaining radial loads and one-direction thrust loads.

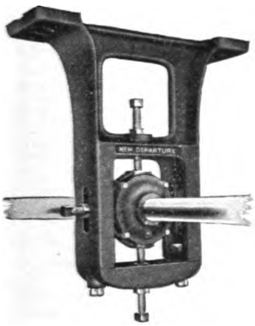


New Departure Single Row

The adaptability of New Departure bearings to machine tool installation is interestingly set forth in a series of illustrated data sheets which will be sent on request to all interested.

We solicit an opportunity to demonstrate this high-grade American product to all who are interested in the use of ball bearings. The co-operation of a highly specialized engineering department is offered to you.

NEW DEPARTURE BALL BEARING SHAFT HANGERS



New Departure Ceiling Hanger

New Departure ball bearing shaft hangers have been developed and perfected by practical experts along strictly scientific lines. The ball bearing employed in this hanger has been especially designed for the purpose and has the circular race which eliminates all liability of cramping or working loose by shaft deflection. The load always remains at right angles to the shaft and the balls always rotate in a true circular path, and instantly adjust themselves to any shaft deflection. Literature, with tables of sizes of both ceiling and post types, will be sent on request.

RHINELAND MACHINE WORKS CO.

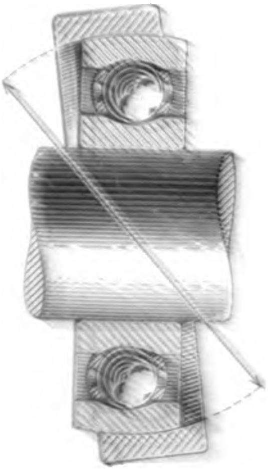
140 W. 42ND ST., NEW YORK CITY

RHINELAND BALL BEARINGS

RADIAL AND THRUST BEARINGS

Rhineland Ball Bearings are made for all machinery purposes, and include every desirable type and size. Manufactured in four series, light, medium, heavy and extra heavy with corresponding load-carrying capacities.

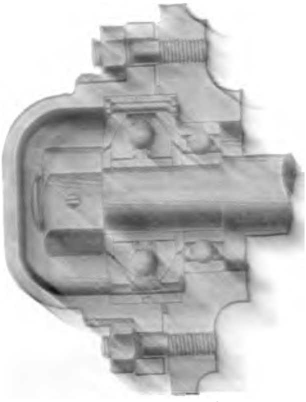
Radial Bearing



Self Aligning Bearing

SELF ALIGNING BEARINGS

The Self-Aligning Bearing is particularly suitable [illegible] similar service, because of [illegible] any faulty alignment, its [illegible] and permanent durability. [illegible] especially appre- [illegible] who have had [illegible] ordinary shaft [illegible] self-aligning bearings.



[illegible]

DOUBLE-ACTING THRUST BEARINGS

[illegible] Double-Acting Thrust Bearing [illegible] other types in that [illegible] is required instead of two [illegible] bearings.

[illegible] decided saving [illegible] space and also by [illegible] gives a very [illegible] problems [illegible].

[illegible] and [illegible] on request.

THE METALINE COMPANY

Corporate name changed from
NORTH AMERICAN METALINE CO.
April 10, 1912

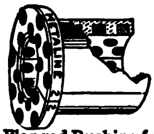
WEST AVE. NEAR BORDEN, LONG ISLAND CITY, N. Y.

METALINED OR OILLESS BEARINGS AND BUSHINGS

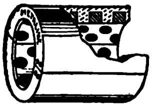
Metaline is composed of metallic oxides and other substances reduced to an impalpable powder and then solidified in hardened steel moulds under great pressure into short length plugs 3/16 in., 1/4 in. and 5/16 in. in diameter.

These plugs are inserted into holes drilled in divided bushings of gun metal bronze, phosphor bronze, or composition metal of good quality.

The two halves of the bushing having been soldered together and then machined all over to specified finished dimensions, are separated and holes drilled into the bearing surface—not all the way through the wall of the bushing—intowhich the Metaline plugs are tightly fitted and then filed flush with the bearing surface, care being taken to see that the spacing of the plugs is such that they will overlap or break joints, particularly along the line of motion.



Flanged Bushing for loose pulleys or for boxes having an end or collar bearing



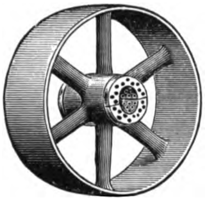
Plain Bushing for boxes or pulley block sheaves where there is no end bearing

" METALINE "
(Trade Mark)
Registered in United States Patent Office, Act of Congress
Approved February 20, 1905

Bearings fitted with plugs of Metaline as described above are self-lubricating, being positively oilless; indeed no oil or other lubricant should be used.

It has been proved that they last for many years, and, if the Metaline plugs are renewed before over-much wear of the bearing surface has taken place, the life of the bushing or bearing will be very greatly prolonged.

Cleanliness is a very desirable feature, which with the elimination of the danger of fire, a risk attending the use of fluid or semi-fluid lubricants in the other types of bearings, should particularly commend the use of Metaline.

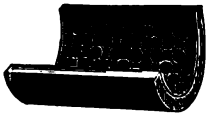


Loose pulley after being fitted with a set of two metalined flanged bushings

Sheave fitted with plain or unflanged metalined bushing

It is conceded by the manufacturers that metalined bearings are not suitable for some lines of service; but it is claimed that these bearings give unusual satisfaction for tackle blocks, wire rope and tramway sheaves, loose pulleys, friction clutch pulleys, idler and mule pulleys, elevator pulleys and other places where the bearing revolves around the shaft; line and counter shaft boxes, floor stand boxes, ventilating fans, small motor bearings, etc.

One-half flanged bushing



One-half plain bushing

[illegible]

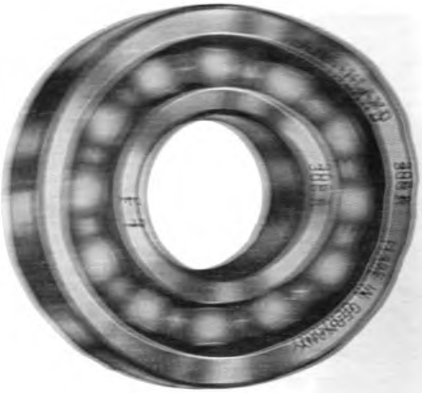
RHINELAND MACHINE WORKS CO.

[illegible] NEW YORK CITY

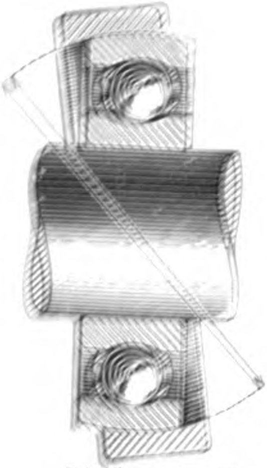
RHINELAND BALL BEARINGS

RADIAL AND THRUST BEARINGS

[illegible] this every desirable type and size. Manufactured in four series: light, medium, heavy and extra heavy with corresponding load-carrying capacities.



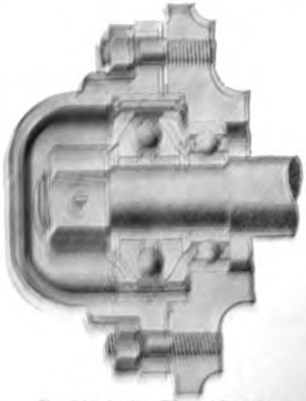
Radial Bearing



Self Aligning Bearing

SELF ALIGNING BEARINGS

The Self-Aligning Bearing is particularly suitable for line shafting and similar service, because of ability to adjust itself to any faulty alignment, its increased load capacity and permanent durability. This feature is one that will be especially appreciated by millwrights and others who have had trouble from faulty alignment with ordinary shaft bearings and with ordinary self-aligning bearings.



Double-Acting Thrust Bearing

DOUBLE-ACTING THRUST BEARINGS

The Rhineland Double-Acting Thrust Bearing is a notable advance over other types in that only one row of balls is required instead of two as in other double-thrust ball bearings.

Our construction represents a decided saving in machining and other expense and also by reason of the smaller space required, gives a very great advantage in solving many problems of machine design where space is limited.

Catalogs containing full specifications and illustrations of Rhineland Ball Bearings on request.

[illegible] FLEXIBLE ROLLER BEARINGS

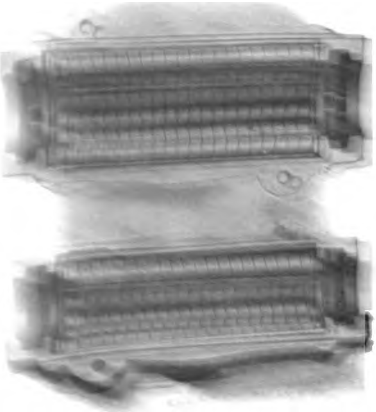
[illegible] FLEXIBLE ROLLER BEARING LINE SHAFT BOXES

[illegible]

Four-Point Set Screw

[illegible] acts as an [illegible] of an oil [illegible] times, making [illegible] without attention.

[illegible] thickness, width and [illegible] its nature as to [illegible] the heaviest load [illegible]



[illegible]

[illegible], cast in two parts [illegible] When assembled [illegible] large French-head screws. [illegible] opposite sides. [illegible] automatic self-closing [illegible] foreign matter. [illegible] box are oil wells. [illegible] in the lower side, and [illegible] outward on the shaft [illegible] the wipers, and [illegible] bearings to be again [illegible] the rollers.

[illegible] tests have been made [illegible] of speed and load [illegible] equipment, and [illegible] have justified our claims [illegible] power from 10 to 25 per cent., depending upon local conditions.

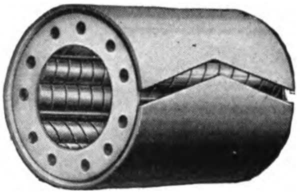
Write for Bulletin 400E.

HYATT ROLLER BEARING COMPANY

SALES OFFICE: 1120 Michigan Ave., CHICAGO

Factory, Newark, N. J. **Detroit, Mich.**

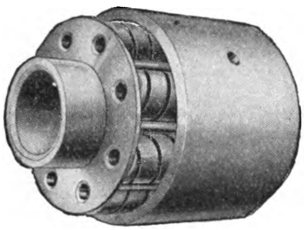
HYATT STANDARD OR COMMERCIAL TYPE



Commercial Type

The Standard or Commercial Type consists of a series of HYATT flexible rollers surrounding the shaft and contained in a yoke or cage. The ends of the cage are provided with slight projections, which hold the rollers in position when the bearing is not in the housing. These projections have nothing to do with operation of the bearing, serving only to make the bearing self-contained. Outer steel races or linings are furnished as a component part of the bearings of this type. The fundamental principle upon which the Standard of Commercial Type is based is that of generous bearing length,—thus reducing the load per unit section to a considerable extent,—the rollers of this type ordinarily are run directly upon the shaft or axle involved in the construction. The rollers are of a special analysis Chrome nickel steel properly heat-treated and ground accurately to size. This is an improvement recently incorporated in bearings of this type, the treated alloy steel superseding the high carbon steel formerly used. In this way the strength of the roller and hence its carrying capacity have been largely increased, and by presenting a harder surface its value has been still further enhanced, enabling it to operate satisfactorily under conditions where the previous type would have been over loaded. Write for Bulletin No. 600-B.

HIGH DUTY TYPE



High Duty Type

The HIGH DUTY TYPE was designed to differ from the STANDARD TYPE in making it possible to concentrate a greater load on the same length, or having the same load, to concentrate it on a shorter length. An improved yoke or cage is used as well as solid hardened and ground inner and outer races. These races, or, as termed, sleeves and linings, are carbonized and heat-treated to give hard surfaces for the rollers to operate on and then ground accurately to close limits both inside and out.

It is confidently believed that both from the standpoint of correct principle, thoroughness of development, as well as care exercised in manufacture, the HIGH DUTY TYPE presents a BEARING second to none, and the results obtained from over a million in daily service justify these conclusions. Write for Bulletin 305-A.

ROYERSFORD FOUNDRY AND MACHINE CO.

52 N. 5TH ST., PHILADELPHIA, PA.

POWER TRANSMISSION MACHINERY AND SELLS ROLLER BEARINGS

SELLS ROLLER BEARINGS REDUCE FRICTION AND SAVE SHAFTING WEAR

A close, five-minute study of the accompanying illustration will show you plainer than words why the all-split, quick-applied **"Sells"** is the foremost, friction-reducing, shaft-saving bearing on the market.

OLD RELIABLE SELLS ROLLER BEARINGS

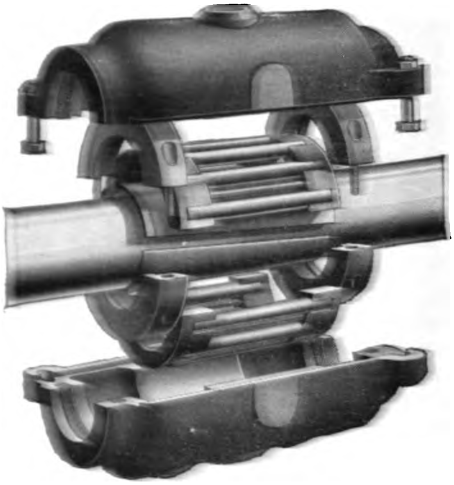
Note the split steel bushing that protects the shaft from wear, and the split collars that clamp it fixedly to the then-protected shafting. See also the split roller structure—how it separates the rollers, eliminating roll-against-roll friction, and holding them parallel to the shafting and each other.

The natural tendency with the "Sells" is for the roller structure to trail at about one-third the speed of the shafting **in the same direction.** It is assisted **in this direction** by every end-thrust against the rotating collars, which, of course, are clamped tight to the shafting. Friction is obviously eliminated at every point.

THE SPLIT BOX

The Split Box is made of a special composition, carefully machined. It is split with a milled tongue and grooved joint and the halves are bolted together.

Reservoirs for lubricant are provided and grease and drain holes are conveniently placed. Felt packing at the ends of the box retains the lubricant and excludes dust.



"Sells" Roller Bearing Boxes
With Single Roller Structure
For Line Shafts and Counter Shafts

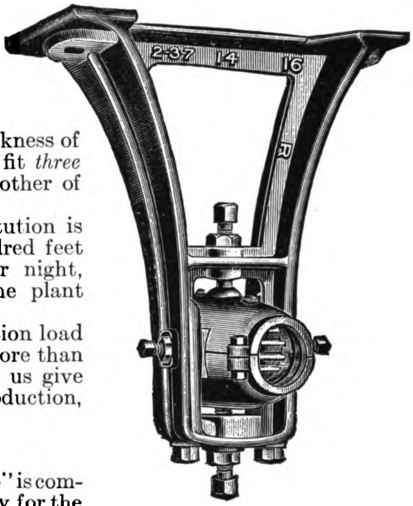
Size of Shaft, Inches	Length of Box, Inches	Width of Box, Inches	Height of Box, Inches	Code
[illegible] & 1"	6[illegible]	2[illegible]	2¾"	Ibex
1 [illegible]/16" & 1¼"	6[illegible]	3"	3 [illegible]/16"	Ice
1 [illegible]/16" & 1½"	7¼"	3¼"	3[illegible]/16"	Idea
1 [illegible]/16" & 1¾"	8"	3¾"	4 [illegible]/16"	Idiot
1 [illegible]" & 2	8[illegible]	3[illegible]	4 [illegible]/16"	Idol
2 [illegible]/16" & 2¼	9[illegible]	4½"	5¼"	Ignite
2 [illegible]/16" & 2½"	10¼"	4¾"	5 [illegible]/16"	Ilk
2 [illegible]/16" & 2¾"	10[illegible]	5[illegible]	6¼"	Image
2 [illegible]/16" & 3	11 [illegible]/16"	5[illegible]/16"	6¼"	Imbibe
3 [illegible]/16" & 3¼"	11[illegible]	6	6[illegible]	Immerse
3 [illegible]/16" & 3½"	12[illegible]	6[illegible]	6[illegible]	Imposo
3 [illegible]/16" & 3¾"	14[illegible]	6[illegible]	7¼"	Imposter
3 [illegible]/16" & 4	15	7[illegible]	7¼"	Improve
4 [illegible]/16" & 4¼"	15[illegible]	7¼"	8[illegible]	Inapt
4 [illegible] & 4[illegible]	16[illegible]	8	8½"	Inca
4 [illegible] & 4[illegible]	16[illegible]	8½"	8[illegible]	Incense
4 [illegible] & [illegible]	[illegible]	8[illegible]	9[illegible]	Income

Heavy Duty "Sells" **Roller Bearing Boxes**
With Double Roller Structures
For Main or Jack Shafts and **Heavy Belt Pulls**

1[illegible] & [illegible]	1[illegible]	3[illegible]/16	4 [illegible]/16	Impound
[illegible] & [illegible]	1[illegible]	4½"	5¼"	Imprint
[illegible] & [illegible]	1[illegible]	4[illegible]	5 [illegible]/16	Inarch
[illegible] & [illegible]	1[illegible]	5[illegible]	6[illegible]	Inborn
[illegible] & [illegible]	16	5½"	6¼"	Inbred
[illegible] & [illegible]	1[illegible]	[illegible]	6[illegible]	Inclose
[illegible] & [illegible]	1[illegible]	[illegible]	[illegible]	Incog
[illegible] & [illegible]	1[illegible]	[illegible]	[illegible]	Indeed
[illegible] & [illegible]	[illegible]	[illegible]	[illegible]	Indent
[illegible] & [illegible]	[illegible]	[illegible]	[illegible]	Index
[illegible] & [illegible]	[illegible]	[illegible]	[illegible]	Indigo
[illegible] & [illegible]	[illegible]	[illegible]	[illegible]	Induce
[illegible] & [illegible]	[illegible]	[illegible]	[illegible]	Infant
[illegible] & [illegible]	[illegible]	[illegible]	[illegible]	Increase
				Incrout

ROYERSFORD FOUNDRY AND MACHINE CO.

POWER TRANSMISSION MACHINERY AND SELLS ROLLER BEARINGS



Royersford Drop Hanger

The illustrations on this page show how Sells Roller Bearing Boxes are applied to Royersford drop hangers, post hangers and pillow blocks. They fit practically any hanger, post-hanger, or pillow block without changing existing equipment. By varying the thickness of the split bushing, the one bearing will fit *three* sizes of shafting. All expense and bother of babbitting is done away with.

As the boxes are split, the substitution is simple and inexpensive. Several hundred feet of line shafting can be changed over night, without interrupting the running of the plant during the day.

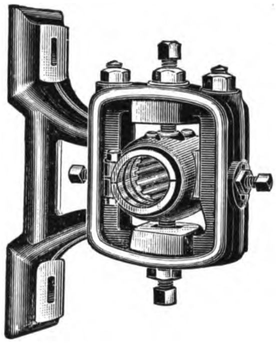
We guarantee a reduction in the friction load of 25% to 50% which annually will more than pay for the cost of substitution. Let us give you specific instances of saving in production, with figures and signatures.

ROLLERINE

ROLLERINE
MANUFACTURED EXPRESSLY FOR THE LUBRICATION OF
ROLLER & BALL BEARINGS
BY
ROYERSFORD FOUNDRY & MACHINE Co.
52 N FIFTH STREET
PHILADELPHIA

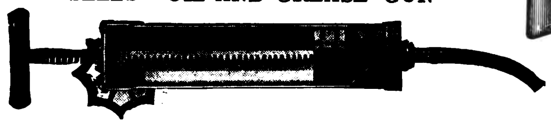
"ROLLERINE" is compounded expressly for the lubrication of "Sells" Roller Bearings and is the best lubricant for all Roller and Ball bearings. "Rollerine" contains 97% of lubricating properties and less than ½% residuum.

When "Rollerine" is used to lubricate the "Sells" Bearings, maximum efficiency is obtained, and the life of the Bearings insured under normal conditions of line-shaft service. Write for free sample.



Royersford
Post Hanger

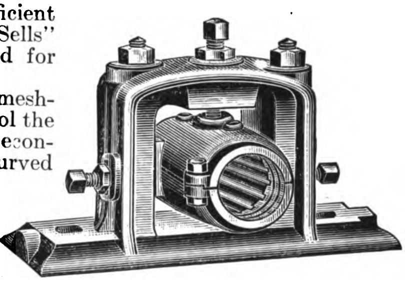
"SELLS" OIL-AND-GREASE GUN



The "Sells" Gun affords the most efficient means for applying "Rollerine" to "Sells" Roller Bearings. It is also adapted for heavy oils and greases of all kinds.

The hand wheel operating a pinion meshing in the rack makes it easy to control the amount of lubricant forced out. The economy of this is very apparent. A curved nozzle adds to the convenience in applying the lubricant.

All parts brass except the steel pinion and malleable iron hand wheel. Workmanship and material first-class. Finish throughout, high grade.



Royersford Floor Stand

THE AJAX METAL COMPANY

PHILADELPHIA, PA. BIRMINGHAM, ALA.

AJAX GENUINE AND BULL BABBITT AND AJAX BULL RING METAL.

AJAX BULL BABBITT

TRADE MARK

We have given this name to a special brand of Babbitt Metal made exclusively by our Company; it is always sold in pigs having on their upper faces the impression of a Bull's head.

This metal was designed for general purposes and answers in most cases where genuine babbitt is being used.

It costs only about one quarter as much as genuine and [illegible]

It can be used [illegible] except those carrying an extremely heavy load, [illegible] speeds.

AJAX GENUINE BABBITT

This is a tin-base babbitt [illegible] which can be thoroughly [illegible] in which a thin shell [illegible] bearings which sustain heavy loads, has [illegible] tougher than the lead-base babbitts [illegible] is unsurpassed.

TESTS

Samples of Genuine and Bull Babbitt [illegible] tension, compression and [illegible] following results.

[illegible]

AJAX BULL RING METAL

[illegible] of all [illegible] metal that [illegible] running of [illegible] from cast [illegible] ring metal [illegible] sufficiently high [illegible] of expansion [illegible]

[illegible] mineral [illegible] soundly [illegible]

LUMEN BEARING COMPANY

BUFFALO **TORONTO**

BRASS FOUNDERS

We will be pleased to offer specific information to engineers, concerning the alloys here enumerated. These alloys are in constant demand, having been designed particularly for engineering purposes.

Alloy No. 00, A, B, and C.	For extremely heavy pressures. (1/32″ deflection at 100,000 lb. under test.)
Alloy No. 0	For acid resisting construction.
Alloy No. 1	For same service as "G" bronze Navy Department, Bureau of Steam Engineering.
Alloy No. 3	For steam engine slide valves.
Alloy No. 4	For bearings at high speeds and under heavy pressures. The standard phosphor bronze for bearing purposes.
Alloy No. 8	For electrical purposes. Pure copper; conductivity about 85.
Alloy No. 9	Manganese bronze. Tensile strength 70,000 to 75,000. Elongation (2″) 20% to 25%.
Alloy No. 14	For lathe head stocks. A bronze having the lowest co-efficient of expansion of the copper-tin alloys.
Alloy No. 15	For gears under severe service.
Lumen	For machine tool bearings. Compressive strength 85,000 pounds.

A. ALLAN & SON

498 GREENWICH STREET

NEW YORK

INVENTORS AND SOLE MANUFACTURERS OF
ALLAN RED METAL AND ALLAN BRONZE

ALLAN BRONZE

[illegible] conspicuous [illegible] service.

ALLAN RED METAL

[illegible] efficiency [illegible] metal [illegible] bearing [illegible] steam packings. [illegible] pressure [illegible] temperature up to 170 pounds [illegible]

PISTON ROD AND VALVE STEM PACKINGS

[illegible] stem packings, will [illegible] do not [illegible]

VALVE DISCS

[illegible] vulcanized [illegible] service.

BEARINGS AND BUSHINGS

[illegible] conditions of neglect [illegible] the part of shaft. [illegible] which [illegible] features [illegible] critical time. [illegible] must [illegible] at our works [illegible] 12 [illegible] bronze at [illegible]

A. ALLAN & SON

494 Greenwich Street
NEW YORK

INVENTORS AND SOLE MANUFACTURERS OF ALLAN RED METAL AND ALLAN BRONZE

FACING HIGH AND LOW PRESSURE PISTONS

Millions of pounds of Allan Red Metal have been used for facing H. & L. pressure pistons, with the result that to-day Allan Metal faced pistons are acknowledged by engineers as the most advanced design in piston construction. It reduces the friction and wear, overcomes scoring of cylinders, and keeps same in a smooth and polished condition. It makes the bull ring last the life of the engine and eliminates cylinder reboring. Our booklet, "The Heart of the Engine—The Seat of Power," is a treatise on piston design and covers in detail the application of Allan Red Metal to pistons. We carry in stock tons of segment castings of all size for pistons from 10″ to 110″ diameter.

ECONOMY

You cannot expect to attain a high standard of economy in your plant if you consume a large percentage of the power produced in overcoming excessive friction in the reciprocating parts of your engines and mills any more than poor piston valve regulation.

You cannot afford to overlook the use of materials or advanced designs that tend to minimize friction, wear and the possibility of shut-down; thereby showing an efficiency, by the economy in fuel consumption, reduction in plant's maintenance cost and bearing up-keep.

OUR GUARANTEE

Bearing alloys sold by us are expected to give the efficiency we claim and on which we receive your orders. If they fail, return the scrap at our expense. We will refund your money.

All our bearing alloys are made from the best brands of Virgin metals, under able mechanical and metallurgical supervision, to maintain at all times the quality and uniformity of our alloys.

For twenty-two years we have been exclusively bearing metal specialists.

BOSTON BELTING COMPANY

256 DEVONSHIRE ST., BOSTON

[illegible] — 61 P[illegible] St — 172 W. Randolph St — 50 F[illegible] St — 115 F[illegible] St.
New York — Buffalo — Chicago — San Francisco — Portland, Oregon

MECHANICAL RUBBER GOODS: BELTING, HOSE, PACKING, ETC.

TRANSMISSION BELTING

Rubber Belting is perfectly uniform in width and thickness. It is not readily affected by heat or cold and is well adapted for use in damp and wet places. It is strong, durable, grips the pulleys closely and does not slip.

Brands — Ex[illegible] Red Enameled, Imperial [illegible]ned, Elmwood, Boston, Niagara, Tremont, Universal.

Adapted for all conditions of service; made from qualities and weights of [illegible] and grades of rubber which assure maximum service and economy.

Gutta-Balata Belting; a high-grade textile belt, adapted for power transmission, also for conveying; so constructed that belts of larger and heavier have [illegible] faces, and either side can be run next the pulleys; not injuriously affected by moderate quantities of oil or grease.

Conveyor Belting; made all widths and thicknesses, with regular rubber cover, [illegible] rubber cover on one or both sides, and reinforced edges; adapted [illegible] troughing pulleys, for carrying coal, ores, grain, gravel, sand, [illegible].

HOSE, rubber, for water, steam, gas, air, suction, oil and [illegible].

[illegible] Braided Hose, which [illegible] continuous lengths [illegible] feet, is especially recommended for [illegible] use.

Cotton Hose, rubber-lined, for [illegible] and heavy single [illegible] and heavy [illegible] for all kinds of fire [illegible] equipment.

Unlined Linen Hose, American Underwriters', supplied in all sizes and lengths, [illegible] fire protection equipment. [illegible] all insurance interests.

PACKINGS; sheet form, for flanges, joints, etc., adapted for all conditions of [illegible] piston and valve rod packings, [illegible] square and spiral; for hot and [illegible] hydraulic purposes.

RUBBER PUMP VALVES; [illegible] all shapes and sizes for different styles [illegible] service [illegible].

RUBBER COVERED ROLLERS. New Rollers Complete. Rollers Re-covered. [illegible] coverings, made [illegible] paper and textile [illegible], tobacco [illegible] every purpose for which rubber- [illegible] used.

THE B. F. GOODRICH COMPANY

AKRON, OHIO

Offices in all principal cities

MANUFACTURERS OF MECHANICAL RUBBER GOODS, TIRES, ETC.

BELTING

TRANSMISSION BELTS—Main drivers require the best quality. Weight and weave of duck, amount of stretch in service, and character of cover should be considered. We recommend the following grades:

"PINNACLE"—frictioned-surface, maximum strength, extreme quality.

"TITANIC"—regular covered, extra strong and long lasting for hard service.

"PILGRIM"—regular covered, heavy duck, good friction and cover; for general service.

On small pulleys operating at high speed we recommend:

"MARATHON"—a friction surface belt of highest quality, built on special woven light, flexible duck.

Light drives, such as agricultural service, are well met by "ROB ROY," built on medium duck, and "SIGNAL," built on light weight duck.

CONVEYOR BELTS for conveying ore, coal, rock, etc., call for special qualities in the belt that have taken years of practical experience to develop. A duck of maximum strength and extreme flexibility, a strong friction, a wear-resisting cover, which will remain pliable and an edge armored against chafing are all required. We offer the following grades:

"LONGLIFE"—for severe service, where extreme wear is desired.

"MAXECON"—for ordinary service; low priced, but reliable and serviceable.

For handling grain, packages, etc., there is so little abrasion and the conditions are so dry that belts of ordinary construction can be used. We recommend our

"GRAINBELT"—medium weight duck, cover of usual thickness. Four plies common practice for horizontal conveyors. For bucket elevator belt service heavier plies are required—six plies standard. If heavier duck desired, we recommend "PILGRIM" grade.

"COSSETTE" BELT—one of exceptionally high quality throughout, for handling cossettes in beet sugar factories.

CANNING BELT, special white sanitary cover for food canning factories.

ELEVATOR BELTS for mines and quarries require a duck of extra strength, quality and weight to resist the tensile strains and the action of the bucket bolts. We use a special, tightly woven duck and recommend the following belts built on it:

"AKRON" Elevator Belt—high grade, designed for the hardest service.

"STERLING"—slightly lower grade, for general conditions, stitched when handling very wet materials.

"GOODRICH AXLE LIGHTING" belt meets the severest service known—t of the electric train lighting from the car axle.

POLISHING BELTS—Sometimes called Emery Belts; built on especi strong fabric with light quality, tough friction.

We are also prepared to furnish Grader Belts, Magnetic Take-Off Belt Separator Belts, etc.

JEWELL BELTING COMPANY

Established [illegible]

Main Office and Factory and Chrome Leather Tannery

HARTFORD, CONN.

[illegible] Branch, [illegible]   Western Branch, 167 W. Lake St., Chicago

LEATHER BELTING AND LACING

[illegible] located in the heart of the best Oak Bark producing section [illegible]. Our hides are all selected for the sole purpose of making them [illegible]. Our plants are equipped with the most modern up-to-date [illegible] and appliances especially adapted to the production of high-grade [illegible] at a minimum cost. We make a grade of belt suitable for [illegible] from the heaviest to the lightest. Our grades follow:

JEWELL SPECIAL PLANER BELT

Made from center cuts of specially selected heaviest oak bark tanned hides; [illegible] specially treated for the work it has to do; perfectly balanced; has a maximum of strength and a minimum of stretch and is fully guaranteed.

JEWELL EXTRA BELT

Made of center cuts of heavy oak tanned belting butts from which all shoulder and flank stock has been removed, guaranteed to weigh an average of not less than 16 ounces to the square foot, especially recommended for heavy duty and slow speeds.

JEWELL HARTFORD BELT

Made of the same kind and quality of leather as the Jewell Extra, like it in all respects except thickness or weight; guaranteed to weigh an average of not less than 14 ounces to the square foot; especially recommended for small pulleys and high speeds.

JEWELL DYNAMO BELT

Always made in doubles from specially selected pliable oak tanned leather; perfectly balanced and constructed with special reference to the work it would have to do on electrical and other machinery having small pulleys running at high speeds.

All the above grades are fully guaranteed as to every detail of material and workmanship. All are put together with waterproof cement and oil dressed at special prices upon special request.

JEWELL DIVER BELT

Made of the very best selected heavy oak tanned leather, put together with waterproof cement and heavily oil dressed; specially recommended for heavy duty and where there is more or less dampness and steam.

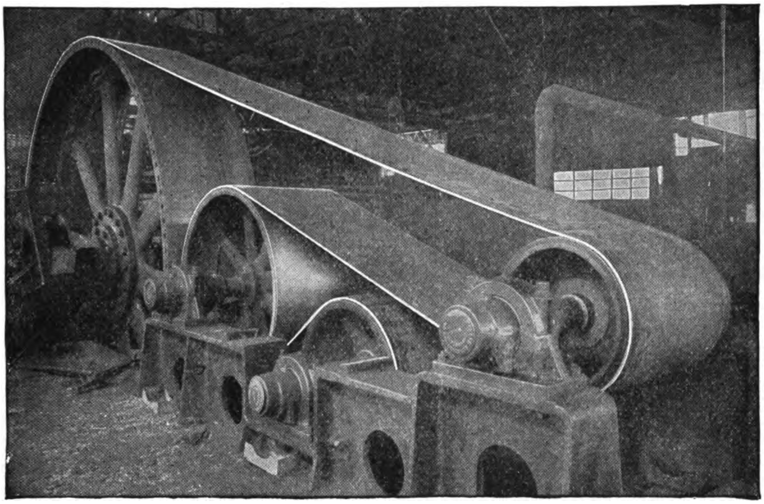
JEWELL ROUND BELTING

We are the largest manufacturers of Round Belting in the world. It is used on sewing machines and all other machinery where a grooved pulley is required; for bell and register cord in street cars. Our production is over ten million feet annually. It is made in all sizes from $\frac{1}{8}$ inch to $\frac{7}{16}$ inch.

JEWELL BELTING COMPANY

JEWELL CHROME LEATHER

Undoubtedly the most remarkable leather product of the Twentieth Centurn; tanned by a special process which produces a leather that isn't injured by the action of hot or cold water, steam, oil, gas and many acids.



48-in. 3-ply Chrome Belt transmitting up to 1900 horse power, at plant of Atlanta Steel Co. Atlanta, Ga. This Belt has already lasted more than 100 per cent. longer than the best oak tanned belt ever used on this drive before.

JEWELL CHROME BELT

The Jewell Chrome leather put together with a waterproof cement making a belt that is not affected by steam, gas, water, etc., as above stated, and in addition a belt that has the greatest possible pliability combined with the greatest tensile strength and the least tendency to stretch. It will slip less on the pulleys, transmit more power per inch of width with less loss of power than any belt known. The illustration herewith is a fair sample of what it will do.

BLACK JEWELL BELT LACING

Made both in sides and cut lace; the strongest and most economical Belt Lacing known.

OTHER JEWELL PRODUCTS

Other Jewell products are Agricultural Belting, Binder Straps, Trunk Straps, Skate Straps, Fan Belts, Automobile Leathers such as Brake Bands, Clutch Facings, Straps, etc., Polishing Leathers, and

POTTER'S PATENT BELT HOOKS

THE GRATON & KNIGHT MFG. CO.

[illegible] U. S. A.

[illegible]
Pittsburg, Pa.
Portland, Ore.
San Francisco, Cal.
Seattle, Wash.
St. Louis, Mo.

OAK LEATHER TANNERS AND BELT MAKERS

BELTING

SPARTAN [illegible] special tannage guaranteed to [illegible] excessive pulley friction. [illegible]

IMPERIAL BRAND [illegible] center stock in single [illegible] heavy work with [illegible]

NEPTUNE [illegible] belting. It is made from the [illegible]

HEART BRAND [illegible] belting made from the [illegible]

[illegible] BRAND [illegible] and is of the [illegible] somewhat lighter [illegible]

[illegible] DYNAMO [illegible] the Heart and [illegible] only in doubles. [illegible] speed machinery, such as motors, [illegible]

EXTRA SHORT LAP [illegible] made in both singles and [illegible] successfully where the work does [illegible]

[illegible] BRAND [illegible] Short Lap in weight only; it is [illegible] not exceeding 8" in [illegible]

CYLINDER BELT [illegible] both singles and doubles. [illegible]

OTHER G & K PRODUCTS

[illegible]
Lace Leather.
Cup Packings.
Washers.
Straps.

[illegible] etc.

[illegible] superior quality and honest [illegible]

MAIN BELTING COMPANY

PHILADELPHIA

NEW YORK CHICAGO BOSTON
PITTSBURGH SEATTLE BIRMINGHAM

MAIN BELTING CO. OF CANADA, LTD.

MONTREAL TORONTO CALGARY

LEVIATHAN
ELEVATING
TRANSMITTING
CONVEYING
BELTING

Leviathan Belting has withstood all manner of tests for more than thirty years, and it is today the most serviceable belting made for elevating, transmitting and conveying.

It is sold strictly for its service value, on the principle that the man who buys a belt is interested chiefly in *quality of service* and regards price as of minor consideration. For this reason, Leviathan Belting is not in competition with other belting—it is simply the best belting for service.

You buy Leviathan under a guarantee which continues our responsibility beyond payment until the belt has earned in actual service its full cost as compared with the service of any other belt of any kind, under the same or similar conditions.

Every piece of Leviathan measures up to the four chief requirements of the ideal belt—strength against stretching, ample traction, wearability and resisting qualities.

ANACONDA, THE SPECIAL BLACK COMPOSITION BELT

Our Anaconda Belt is made of the regular high-grade heavy Leviathan canvas, specially treated to give it resisting qualities under all sorts of extraordinary conditions. It is not only waterproof, but is also capable of withstanding a high degree of temperature.

It is the belt to use for transmitting and conveying under conditions involving exposure to high temperature, steam, water or rough weather.

THE ROSSENDALE-REDDAWAY BELTING AND HOSE COMPANY

NEWARK, N. J., U. S. A.

"CAMEL HAIR" BELTING, CANVAS STITCHED BELTING, SOLID COTTON BELTING, ARABIAN "ASBESTOS BRAKE LINING."

"CAMEL" BRAND "CAMEL HAIR" BELTING

This belt is remarkable for its great strength (almost twice that of the leather belting), long life, small slippage, minimum stretching, straight true running, and for the fact that it is less affected by dampness or acid fumes than any other kind of belting. This belting is also sold under a guarantee that it will give longer, better service than any other style of belting running under the same conditions. Made in four thicknesses as follows:

SINGLE "CAMEL" which corresponds to single leather or to 4-ply canvas and rubber.

MEDIUM "CAMEL" which corresponds to heavy single leather or to 5-ply canvas and rubber.

DOUBLE "CAMEL" which corresponds to double, and heavy double leather or to 6- to 8-ply rubber and canvas.

Extra heavy "Camel" to correspond to triple leather and all extra heavy types of belting.

STITCHED CANVAS BELTING "SPHINX BRAND"

Thoroughly equal to the best on the market in this type of belts, and affords economy if substituted as follows:

8-ply in place of double leather or 5 and 6-ply rubber.
6-ply in place of light double leather or 5-ply rubber.
4-ply in place of single leather or 3-ply rubber.
10-ply where extraordinary strength is required.

Made in all weights.

"BLACK-BIRD" WOVEN COTTON BELTING

FOR TRANSMISSION AND CONVEYOR WORK

An improved woven belt manufactured under high tension from the finest quality of long-staple cotton.

Impregnated with a special composition which protects the fibre, keeps the belt pliable, and prevents it from becoming hard and dry.

Will run well in steamy or wet places and on drives exposed to the weather.

ARABIAN "ASBESTOS BRAKE LINING"

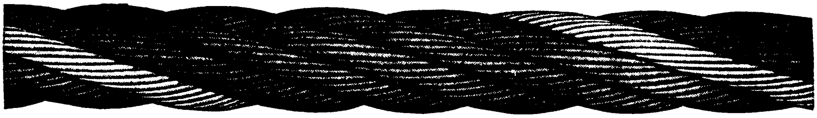
Especially suitable for automobile brakes. Made in all widths from one to four inches. Standard thicknesses $\frac{3}{16}''$ and $\frac{1}{4}''$.

BRODERICK & BASCOM ROPE CO.

NEW YORK ST. LOUIS SEATTLE

Factories, St. Louis and Seattle

WIRE ROPE AND AERIAL TRAMWAYS



YELLOW STRAND

The strongest of all Steel Ropes

Compare the figures in the table below with those of any Plow Steel wire rope. Then you will have the real reasons for Yellow Strand's greater durability and resulting economy.

Yellow Strand's great strength permits the use of smaller rope for the same work, or heavier work with the same size rope. Its unusual flexibility gives it long life on derricks and for similar uses where the sheaves are small and the work heavy.

YELLOW STRAND WIRE ROPE

19 wires to the strand. Hemp center

TELEGRAPH NAME	Diameter in inches	Circumfer. in inches	Approx. weight per foot	Approx. strength tons 2000 lbs.	Prop. work load tons 2000 lbs.	Diam. drum or sheave feet advised
Noggin	¼	¾	.10	3.15	.63	1
Nopal	5/16	1	.15	4.50	.9	1¼
Norma	⅜	1⅛	.22	6.75	1.35	1½
Nugget	7/16	1¼	.30	9.4	1.9	1¾
Nabob	½	1½	.39	12.1	2.4	2
Nachar	9/16	1¾	.50	14.5	2.9	2¼
Nacon	⅝	2	.62	19	3.8	2½
Nadir	¾	2¼	.89	26.3	5.3	3
Namur	⅞	2¾	1.20	35	7	3½
Nectar	1	3	1.58	45	9	4
Nelson	1⅛	3½	2	56	11	4½
Nero	1¼	4	2.45	69	14	5
Neptune	1⅜	4¼	3	84	17	5½
Newton	1½	4¾	3.55	98	20	6
Nina	1⅝	5	4.15	110	22	6½
Nimrod	1¾	5½	4.85	133	27	7
Nocent	1⅞	5¾	5.55	150	30	8
Nomad	2	6¼	6.30	166	33	8
Nolta	2¼	7⅛	8	210	42	9
Nucleus	2½	7⅞	9.85	263	53	10
Nurse	2¾	8⅝	11.95	315	63	11

Yellow Strand is also made with 7 wires to the Strand, and with wire center.

Grade for grade, our other brands of wire rope are just as superior as our Yellow Strand. Try B. & B. Plow Steel, Crucible Cast Steel, Patentsteel and Swedes Iron Elevator Ropes. They last longer.

Order direct or through any authorized agent. There is one in your locality.

Catalog No. 2D on request.

AMERICAN STEEL & WIRE COMPANY

[illegible] New York Worcester Cleveland Pittsburgh Denver U. S. Steel Products Co.
[illegible] Los Angeles Portland Seattle Export representatives 30 Church St., New York.

MAKERS OF THE AMERICAN AERIAL TRAMWAYS, BLEICHERT SYSTEM

(Succeeding the Trenton Iron Co.)

USING AMERICAN WIRE ROPE

The Bleichert System of Aerial Tramways is one whereby the material is [illegible] suspended from carriages running on stationary [illegible] carriers along one cable [illegible] motion [illegible] which the carriers are [illegible].

No matter what the contour of the ground a Bleichert tramway will [illegible] where it is to [illegible] per ton a mile.

[illegible]

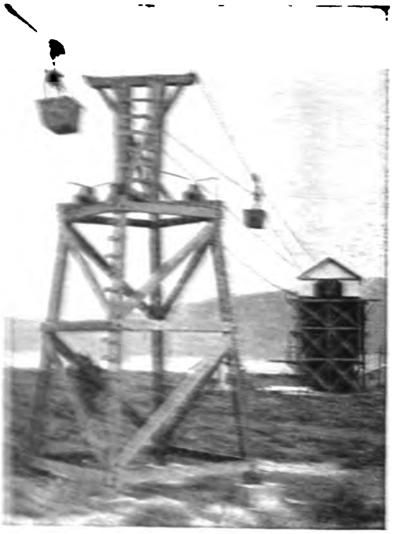


Fig. 1 Support in Bleichert Tramway

[illegible] designed to corre[illegible] Bleichert Tramway. One [illegible] distance of 21 [illegible] loading terminal is [illegible] the discharge [illegible] the capacity of the [illegible] tons per hour. Other [illegible] in operation up to 250 tons [illegible]

[illegible] on this line exceed[illegible] in the clear. Spans [illegible] 000 [illegible] in any line are not [illegible] the spacing of the [illegible] ordinary conditions [illegible] 00 to 300 ft.

[illegible] patented [illegible] construction (Fig. 2

Fig. 2 Patent [illegible]

Fig. 3 Patent Coupling

AMERICAN STEEL & WIRE COMPANY

THE BLEICHERT SYSTEM OF AERIAL TRAMWAYS

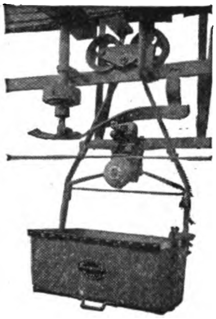


Fig. 4 Carrier with Webber Patent Compression Grip, showing patent automatic attacher

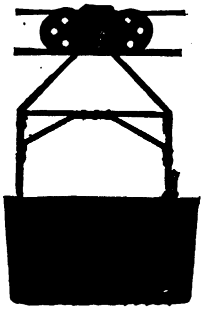


Fig. 5 Carrier with Bleichert Patent Automatic Overhead Grip

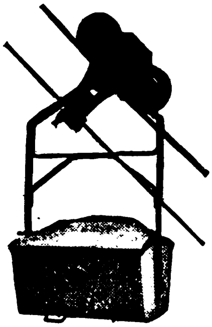


Fig. 6 Carrier with Bleichert Patent Automatic Underhung Grip

the smooth surface of which conduces toward a very uniform wear, which adds to the life of the cable and of the wheels that run on it.

These cables are made of a select grade of steel, in lengths varying from 500 to 1500 ft. which are joined by patented steel couplings illustrated in Fig. 3.

The grips for attaching the carriers to the traction rope are simple in construction, powerful, strong and efficient.

They are made for ropes running below or above the track cables according to the exigencies of the case, as shown in the cuts above. Fig. 4 represents the ordinary form of carrier with underhung grip suspended from a terminal rail, in the act of being mechanically attached to the traction rope. Fig. 5, a carrier with the Bleichert patent automatic overhead grip; and Fig. 6 a carrier with the Bleichert patent automatic underhung grip.

In the latter two the grips form an integral part of the carriage construction and operate in such a way that the weight of the carriers in any case acts as the gripping force in closing the jaws against the rope. These grips, therefore, are independent of any nice adjustment of the jaws and automatically accommodate themselves to irregularities of the rope which is a great advantage in long lines.

An overhead grip with positive operating mechanism is also made.

Well tried devices are provided for attaching and detaching the grips automatically at the terminals and other stations as may be required.

No buttons, lugs, or knots of any kind are required on the traction rope. This fact adds greatly to the life of the rope, since the wear is distributed uniformly over the entire rope and not confined to certain spots.

The same advantage pertains to these grips as compared to permanent connections of any kind. The ability to strip the line readily of its carriers when occasion occurs for resplicing the traction rope, or while making repairs is of itself a very great advantage.

Receptacles especially designed for any purpose are made of all kinds of materials. Buckets are most commonly used as shown in the illustration above, and these may be self-dumping if desired.

By cars especially designed to hold one or more buckets, the material may be transferred to and from surface tracks at the stations without rehandling.

Scales are furnished, if desired, specially designed for weighing the loaded carriers, or counters for automatically registering the number transported.

A. LESCHEN & SONS ROPE COMPANY

Established 1857

ST. LOUIS, MO.

New York **Chicago** **Denver** **Salt Lake** **San Francisco**

WIRE ROPE FOR ALL PURPOSES

AERIAL WIRE ROPE TRAMWAYS IN VARIOUS SYSTEMS

HERCULES WIRE ROPE

TRADE MARK REGISTERED

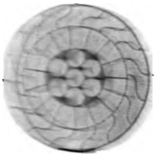
[illegible] combines strength, [illegible] maximum wire rope efficiency. [illegible] conditions of all wire [illegible] identification pur-[illegible]

[illegible] Special Steel, [illegible]

[illegible] we make wire ropes in all [illegible] conditions. Among [illegible]

[illegible] CONSTRUCTION

[illegible] conform to a [illegible] wear [illegible]



Cross Section Locked Coil Cable for Tramways

[illegible] CONSTRUCTION

[illegible] surface layer [illegible] strength [illegible] smooth bearing surface reduces wear and minimizes vibration.

Descriptive catalogs gladly furnished upon request.

JOHN A. ROEBLING'S SONS CO.

TRENTON, N. J.

WIRE ROPE OF ALL KINDS

ROEBLING

We manufacture and keep in stock at our works at Trenton and at warehouses, at agencies and branches in large cities wire rope made from Swedish Iron, Cast Steel, Extra Strong Cast Steel, Plough Steel and Improved Plough Steel.

We give below tables of strengths, etc., for the standard constructions of IMPROVED PLOUGH STEEL ROPE. The rope is also furnished with 6 strands of 37 wires each and with 8 strands of 19 wires each.

This rope is recommended as the best to use where extreme conditions tend to bring extraordinarily severe stresses, and is particularly well adapted to resist abrasion.

The hemp center of this rope is colored blue to distinguish it from other wire ropes.

A copy of our catalogue, giving information about other wire ropes, and wire rope fastenings will be mailed on application.

IMPROVED PLOUGH STEEL HOISTING ROPE

Composed of 6 Strands and a Hemp Center, 19 Wires to the Strand.

Trade Number.	Diameter in inches.	Approx. circumf. in inches.	Approx. weight per foot.	Approx. strength in tons of 2000 lbs.	Proper working load in tons of 2000 lbs.	Dia. of drum or sheave in feet advised.
00	2¾	8⅝	11.95	315	63	11
0	2½	7⅞	9.85	263	53	10
1	2¼	7⅛	8	210	42	9
2	2	6¼	6.30	166	33	8
2½	1⅞	5¾	5.55	150	30	8
3	1¾	5½	4.85	133	27	7
4	1⅝	5	4.15	110	22	6½
5	1½	4¾	3.55	98	20	6
5½	1⅜	4¼	3	84	17	5½
6	1¼	4	2.45	69	14	5
7	1⅛	3½	2	56	11	4½
8	1	3	1.58	45	9	4
9	⅞	2¾	1.20	35	7	3½
10	¾	2¼	.89	26.3	5.3	3
10¼	⅝	2	.62	19	3.8	2½
10½	9/16	1¾	.50	14.5	2.9	2¼
10¾	½	1½	.39	12.1	2.4	2
10a	7/16	1¼	.30	9.4	1.9	1¾
10b	⅜	1⅛	.22	6.75	1.35	1½
10c	5/16	1	.15	4.50	.9	1¼
10d	¼	¾	.10	3.15	.63	1

IMPROVED PLOUGH STEEL ROPE

For Haulages and Transmissions. 6 Strands and a Hemp Center, 7 Wires to the Strand.

11	1½	4¾	3.55	90	18	11
12	1⅜	4¼	3	79	16	10
13	1¼	4	2.45	67	13	9
14	1⅛	3½	2	52	10	8
15	1	3	1.58	42	8.4	7
16	⅞	2¾	1.20	33	6.6	6
17	¾	2¼	.89	25	5	5
18	11/16	2⅛	.75	20	4	4¾
19	⅝	2	.62	17½	3.5	4½
20	9/16	1¾	.50	13	2.6	4
21	½	1½	.39	11	2.2	3½
22	7/16	1¼	.30	7¾	1.5	3
23	⅜	1⅛	.22	6½	1.3.	2½

THE SPENCER WIRE COMPANY

[illegible] MASS.

[illegible] Offices in
[illegible] York, Philadelphia,
[illegible]ago, St. Louis, New Orleans

MANUFACTURERS OF IRON AND STEEL WIRE, HIGH CARBON TEMPERED AND UNTEMPERED FLAT WIRE, WIRE SPECIALTIES AND WIRE ROPE

WIRE

This Company has been headquarters for many years for Extra Fine and [illegible] Bookbinders', Bonnet, Broom, and [illegible] Flat Small Shapes. White-Liquor [illegible] Straightened and Cut Stock of innumerable [illegible] in addition, [illegible] Wires of every sort. Tempered Brush and [illegible] varieties, especially in fine sizes of [illegible] These wires for manufacturing purposes [illegible] .008 up to ½ inch. Also flat wires in any [illegible] down.

Our different [illegible] summarized as follows:

Market Wire [illegible] Bessemer or Basic steel. It is the kind of wire used for [illegible] and is made in the following finishes: Bright, Annealed, Coppered, [illegible] and Galvanized.

Norway or Swedes Iron Wire [illegible] softest and toughest wire made. Its principal [illegible] high conductivity is required.

Furniture Spring Wire [illegible] drawn steel wire possessing a considerable amount of [illegible] It is widely used for furniture and upholstery springs, and [illegible] coppered, black or tinned finish as ordered.

Bright M. B. Steel Wire [illegible] drawn medium high carbon steel wire, capable of being [illegible] tempered. It is used for the manufacture of springs and similar articles which are hardened and tempered after forming.

Cast Steel Wire made of soft drawn stock, similar to M. B. Steel except that it is higher in carbon and is susceptible of a higher temper. This material is used for articles which are hardened and tempered after forming.

Tempered Cast-Steel Wire wire made of the same grade of material as the previous, but oil-tempered at the finished size. It possesses a high degree of resilience and is the proper material to use for a very live spring that will not set.

Music Spring Wire -the stiffest, strongest, toughest, most resilient and most handsomely finished of all varieties of steel wire. It is made of the highest grade of steel manufactured and is essentially the same kind of wire that is used in the manufacture of piano strings.

Specialties

The Specialty Department, being quite an extensive industry in itself, is prepared to make immediate shipments from a long line of standard wire goods carried in stock, and to submit prices on almost any article which may be formed from wire, either iron, steel, brass, aluminum, or German silver.

WIRE ROPE

We manufacture wire rope of all kinds for all purposes: Elevator Rope; Tiller Rope; Guy Rope; Transmission and Standing Rope; Hoisting and Hauling Rope; Galvanized; Tinned and Copper Sash Cord; Sand Lines; Drilling Cables; Casing; Tubing; Cleaning Out and Dead Lines; Galvanized Yacht and Ship Rigging; Phosphor Bronze, Tiller and Sash Cord.

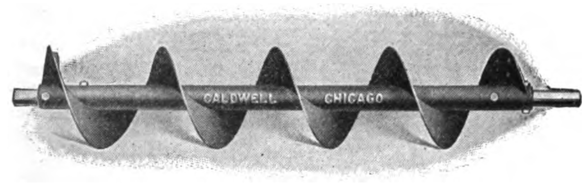
"Spencer Special" High Strength Rope

To meet the constant growing demand for a reliable, strong and flexible wire rope to work under severe conditions in logging, mining, quarrying and heavy hoisting, we especially recommend "Spencer Special" High Strength Rope. "Spencer Special" wire has a breaking strength of 250,000-273,000 lbs. per square inch.

H. W. CALDWELL & SON COMPANY

CHICAGO, ILLINOIS

ELEVATING, CONVEYING AND POWER TRANSMITTING MACHINERY



HELICOID CONVEYOR

Sole manufacturers of "HELICOID" SCREW CONVEYOR.
Made of one continuous strip of metal without lap or rivet.
Mounted on standard and extra heavy pipe or solid shaft.

GEARS

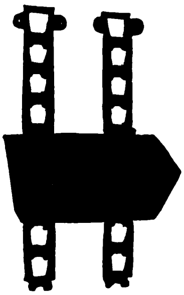
Machine Molded Teeth or Cut Teeth, Spurs, Bevels, Miters, Mortise Wheels, 1" to 6" pitch.

CHAIN

Standard Malleable Detachable Special, Steel Chains for all purposes.

SPROCKET WHEELS

With Chilled Rims and Teeth for hard service.



ELEVATOR BUCKETS

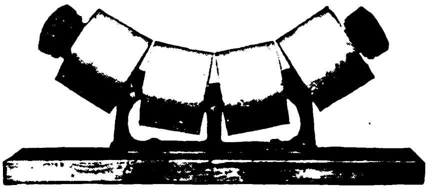
Salem, Caldwell Avery made of Steel, also Special Steel Buckets of all kinds made to order. Malleable Buckets for stone, coal and gritty materials.

STEEL WORK

Elevator Casings, Conveyor Troughs, Spouting Tanks, Pan Conveyors, Elevator Boots.

Belt
Conveyors
for stone,
sand, grain,
coal, etc.

Send for
catalogue
No. 34



Pulleys,
Fly Wheels,
Shafting,
Bearings,
Friction
Clutches,
etc.

[illegible] WEIGHER [illegible]

[illegible]

[illegible] CONTINUOUS AUTOMATIC SCALES [illegible] CONVEYING AND [illegible] MATERIAL HANDLING PLANTS [illegible] CONCRETE [illegible] AND [illegible] MACHINERY

[illegible] BELT CONVEYORS

[illegible]

"[illegible]" Belt Bearing [illegible] and return [illegible] for belt conveyors [illegible]

THE MERRICK CONVEYING WEIGHER

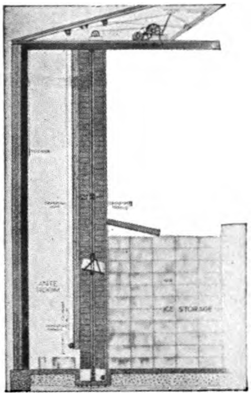
[illegible] the weight of material handled on belt conveyors, [illegible] and overhead trolleys or telphers. The weigher [illegible] levers and a steelyard of special design so that a [illegible] suspended from the weighing levers. The [illegible] connected with a totalizing mechanical integrator which derives its other factor from the travel of the conveyor by means of suitable gearing from a bend pulley on the return belt or a sprocket wheel on a bucket conveyor. This integrator continuously totalizes the product [illegible] quantities. [illegible] The result therefore represents the total weight of material that is plainly indicated by a register.

[illegible]eigher. Front Sheet of Casing Removed.

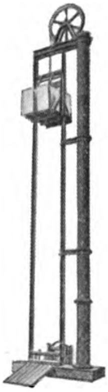
GIFFORD-WOOD CO.

BOSTON HUDSON, N. Y. CHICAGO

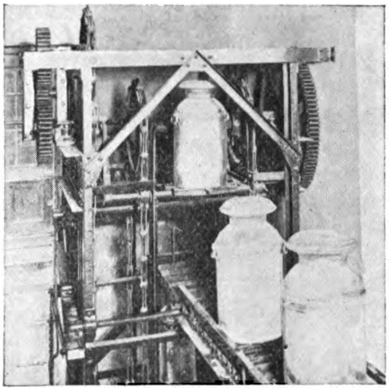
ELEVATING AND CONVEYING MACHINERY; ICE TOOLS



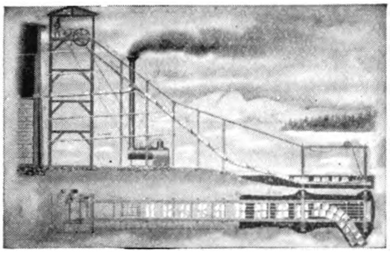
Gig Elevating and Lowering Machine



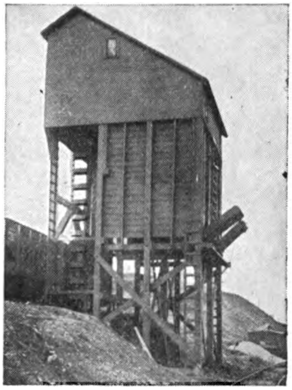
Automatic Lowering Machine



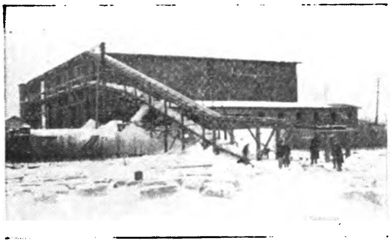
Milk Can Elevator



Ice Elevator

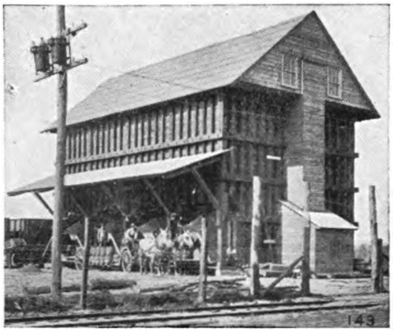


R. R. Coaling Station



Ice Elevator

Wagon Loader



Model Coal Pocket

Send for catalogs and other information desired.

Pneumatic Tubes Selective Carriers

THE LAMSON COMPANY

BOSTON, MASS., U.S.A.

PNEUMATIC TUBES, CASH PARCEL, MESSAGE, AND MAIL CARRIERS; AUTOMATIC SWEEP OFF PICKUP AND SELECTIVE CARRIERS; BELT CONVEYORS, TRAY CONVEYORS, SMALL LIFTS, ELEVATORS, ETC.

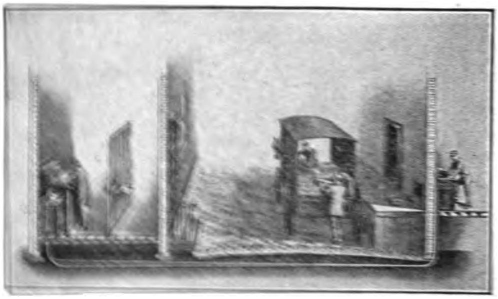
PNEUMATIC DISPATCH TUBES

Designed and installed for all Office, Factory, Warehouse, Postal or Store Service requirement. Vacuum, Pressure, Vacuum Pressure, Unit, "Two-way," Shifting Current or "Steam-jet" types in sizes of tube ranging from 1½ in. to 8 in. diameter. Latest [illegible] inventions. [illegible] stations of Lamson Tubes in use.

Desk Station 4" Mail Tubes in Private Office

HIGH POWER PNEUMATIC TUBES

[illegible]



Carrying Documents Between Buildings

[illegible]

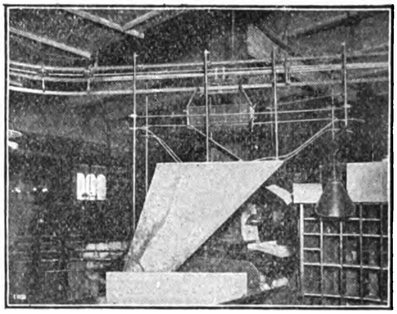
[illegible]

[illegible] Mail Bag Carriers

THE LAMSON COMPANY

AUTOMATIC SWEEP-OFF AND DELIVERY CARRIERS

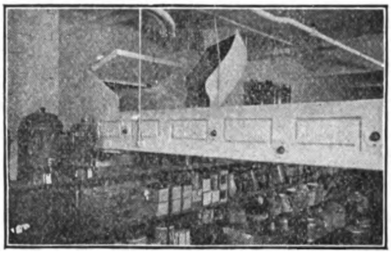
Constantly moving Baskets traveling on circuit lines and arranged to Sweep off Mail, Documents or Parcels from shelves and dump them into receiving chutes at required Receiving Stations. Made in Standard sizes as used by U. S. and Foreign Post Offices, or to Specifications.



Lamson Sweep-off and Dump Carriers for Post Office Work

LAMSON BELT AND TRAY CONVEYORS

All sizes for all conditions of Mail, Merchandise or Parcel Carrying. Special Conveyor Belts to carry Trays are built with Arresting Stations by which a constant supply of material is automatically maintained at each Station. Particular attention to complete Belt Conveyor Systems for assembly of "Send," "C.O.D." and "Transfer" Parcels in large Department Stores.



Store Service Belt Conveyor and Chute Showing Self-closing Fire Door

PICK-UP AND DELIVERY CARRIERS

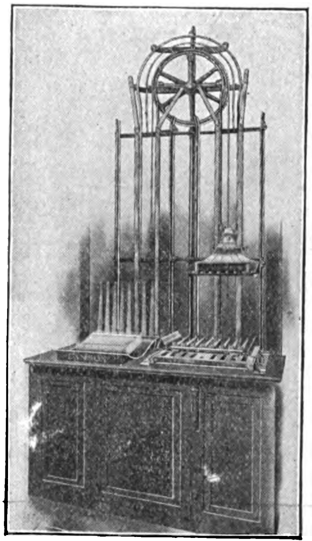
Constantly moving metal "fingers" that noiselessly pick up documents or small articles from one tray or station and deliver them at another as desired. Made in standard sizes to meet special requirements.

SPECIAL CONVEYORS

Made to meet any demand for assembly and distribution of Mail or Merchandise within or between buildings.

Plans and Estimates Free.

Representatives in all Principal Cities.



Will pick up at any station and deliver at any other station

IDANY

APOLIS

FOR EVERY PURPOSE.
MACHINERY.

Wheels
Clutches.

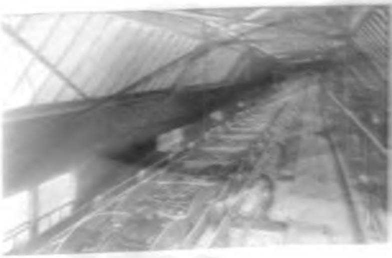
Coal Yards. Coal Tipples.
Screens. Picking Tables.

Telphers, etc.
Conveyors. Coal

Complete Freight

Conveyors.

ABOVE UPON REQUEST


Peck Carrier

Belt Conveyor

ROBINS CONVEYING BELT CO.

PARK ROW BUILDING, NEW YORK

Chicago San Francisco **Spokane**

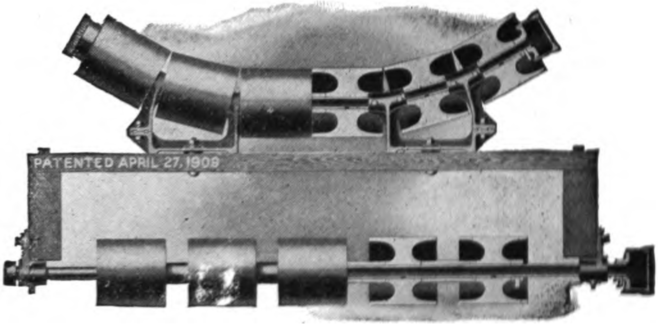
WORKS: PASSAIC, N. J.

CONVEYING, ELEVATING, AND HOISTING MACHINERY

For Handling

Coal
Coke
Ores
Concrete
Rock
Phosphate
Sand
Gravel
Chips
Earth
Cement
Ashes
Boxes
Barrels
Packages
Trunks
Dishes
Bags

ROBINS STANDARD AND ADJUSTABLE COAL AND COKE CRUSHERS



The most important elements of a Belt Conveyor are the Idlers and the Belt, since on these depends its proper operation as well as the cost of handling. The Robins Patent 5-shaft Troughing Idlers, shown above, are universally accepted as the Standard, being the only ones which embody the following important principles of design:

(1) All the pulleys are in the same *vertical plane.* (2) They have continuous hollow-tube grease-lubrication from end to end. (3) The profile of the idler nearly approaches the arc of a circle, preventing sharp bends in the belt. (4) The idlers are adjustable for properly training the belt. They are made in all sizes from 12″ to 60″.

The Robins Patent Reinforced Conveyor Belt, shown above, has been one of the chief factors of the success of the Robins System. Sixteen years of hard trial, under all kinds of conditions, have demonstrated that it is stronger, runs truer, and gives a greater return for the money than any other belt on the market. This is due to the following peculiarities of construction:

(1) The rubber cover is thickened in the center only, *where the wear is greatest.*

(2) The edges are reinforced by extra plies of duck, increasing the strength and making the belt self-supporting between idler sets.

(3) Being very flexible laterally it conforms closely to the shape of the idlers, and therefore runs true even when empty. With this belt no guide idlers are required.

(4) An extra ply of special coarse fibre embedded in the cover and extending around the edges enormously increases the resistance of the cover, and also the adhesion between the cover and the body.

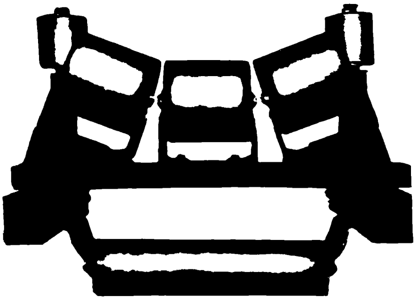
The Robins Monthly Bulletin, containing valuable conveying engineering data, is gladly sent to all interested persons.

STEPHENS-ADAMSON MFG. CO.

AURORA, ILLINOIS

CHICAGO, NEW YORK, PITTSBURG, ST. LOUIS, SAN FRANCISCO,
LOS ANGELES, BOSTON

CONVEYING ENGINEERS; CONVEYING, SCREENING, AND TRANSMISSION MACHINERY.



S-A Ball Bearing Unit Carriers

"S A" BELT CONVEYORS

In the design of this machinery, we have led particularly in its application to contracting work handling sand and gravel in washing and concrete mixing plants, and handling excavation and dam fills. Our experience along these lines makes our engineering service particularly helpful.

THE "S-A" UNIT CARRIER

[illegible] ball bearing carrier possessing the following advantages:

[illegible]. The Unit Carrier is made up of [illegible]. [illegible] Rolls supported on [illegible] brackets which are mounted on steel channels arranged to meet [illegible].

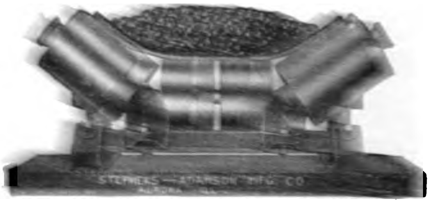
Free Running. The ball bearings reduce the power required 35-40 per cent [illegible].

No Lubrication. The ball bearings [illegible] eliminate the constant attention [illegible].

Strength and Light Weight. The steel construction with individual supports [illegible] highest [illegible]. Each single unit [illegible].

Adjustable. The [illegible] Construction allows perfect flexibility and ease of adjustment [illegible].

STYLE No. [illegible] CARRIER



Style No. [illegible] Carrier

[illegible]

THE "S-A" IMPROVED PIVOTED BUCKET CARRIER

[illegible]

S-A Improved Pivoted Bucket Carrier

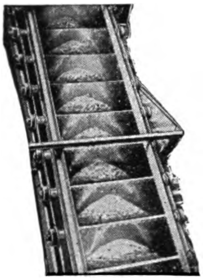
No Spill. [illegible]

Perfect Discharge. [illegible]

Malleable Iron Buckets. [illegible] cannot [illegible]

Perfect Alignment. [illegible] links of each chain [illegible]

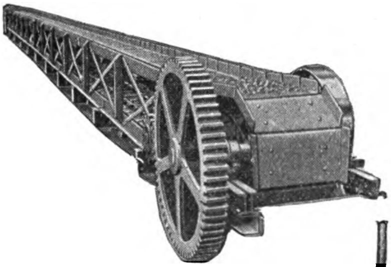
STEPHENS-ADAMSON MFG. CO.



72-inch "S-A"
Jumbo Conveyor

GRAVEL WASHING AND ROCK CRUSHING EQUIPMENT

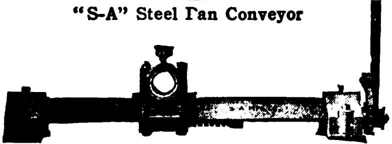
We have designed and equipped hundreds of these plants—commercially successful—in all parts of the country. The steel pan conveyor illustrated here, which is the largest ever built, is handling crushed stone in the plant of the Tomkins Cove Stone Company. It handles a capacity of 1,000 tons per hour up an incline of 45 degrees. The steel buckets are six feet in length and are supported by graphite-bushed self-lubricating steel rollers connected by double steel bar link chains. Many of our large conveyors of this type are in use throughout the country.



"S-A" Steel Pan Conveyor

"S-A" STEEL PAN CONVEYORS

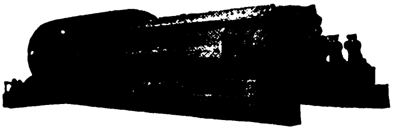
To meet the increasing demand for conveyors of large capacity and reliability, we build several types of steel pan conveyors. These conveyors are absolutely reliable and produce high conveying economy.



Protected Screw Take-ups

PROTECTED SCREW TAKE-UPS

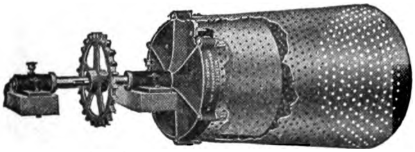
This style of take-up has a standard bearing mounted on a steel angle base. The angle protects the screw, brings the bearing lower. and makes a more powerful and compact take-up than any other type.



No. 9 "S-A" Revolving Screen

"S-A" REVOLVING SCREENS

This type of revolving screen is designed for the severest crushing plant service. We also make many types of screens for lighter service.



"S-A" Improved Gilbert Screen

"S-A" IMPROVED GILBERT SCREEN

The standard screen for washing sand and gravel. The inner skirt takes the greatest wear and triples the life of the outer screen.

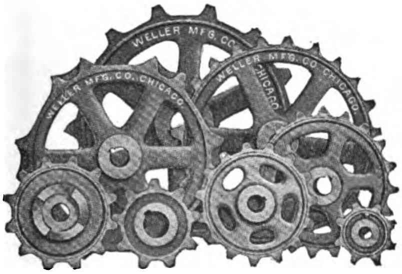
OUR MANUFACTURES AS ILLUSTRATED IN OUR GENERAL CATALOG INCLUDE THE FOLLOWING LINES

- **Bearings**
- **Belt Conveyors** for all applications
- **Brushes, Revolving,** for conveyors
- **Buckets, Elevator,** steel and malleable
- **Cars**
- **Car Hauls**
- **Car Pullers** and movers
- **Chains,** standard detachable, malleable and steel of all types
- **Clutches,** friction and jaw
- **Coal Handling Equipment** for pockets, power stations, washeries and tipples
- **Coal Crushers**
- **Conveyors,** belt, pan, chain for handling ore, coal, ashes, gravel, crushed rock, clay, cement, and all bulk or package products
- **Elevators,** chain and belt, for all applications
- **Feeders,** conveyor, apron, roll and shaking
- **Gates**
- **Gears**
- **Glass Works Conveyors**
- **Gravel Plant Equipment,** washing and screening
- **Hangers**
- **Pillow Blocks**
- **Pulleys**
- **Screens,** shaking and revolving for all applications
- **Sheaves**
- **Spouts**
- **Sprockets**
- **Transmission Systems and Equipment**

friction clutch, steel split, wood split, etc.

rope transmission, wire rope transmission, wire

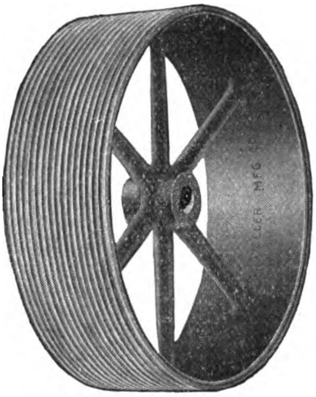
WELLER MANUFACTURING CO.



Sprockets

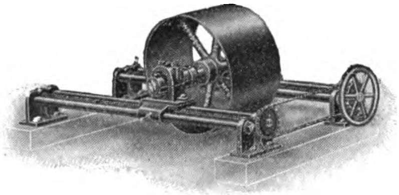
Gears

Pulleys



Sheaves

Dump Cars



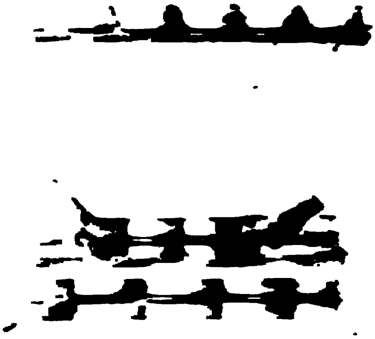
Belt Tighteners

Pillow Blocks

Hangers

(See also next page)

[illegible] RING CO.



[illegible]

[illegible] Improved Power Shovel

Standard [illegible] Elevator Boot

[illegible]

THE ALLIANCE MACHINE CO.

ALLIANCE, OHIO

New York
Pittsburgh

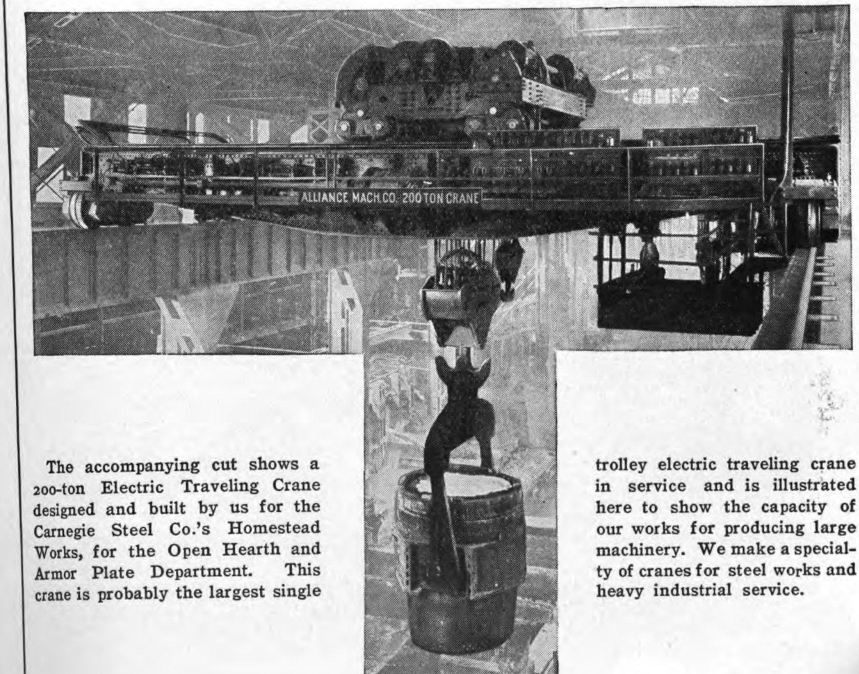
Chicago
Birmingham

ENGINEERS AND BUILDERS OF ELECTRIC TRAVELING CRANES AND MACHINES OF ALL TYPES FOR ALL PURPOSES; I-BEAM HOISTS; ORE BRIDGES; ROLLING MILL AND HYDRAULIC MACHINERY, RIVETERS, STEAM HAMMERS, HEAVY PUNCHES AND SHEARS; COKE PLANT MACHINERY, SCALE CARS AND CHARGING LARRIES; COPPER CONVERTING MACHINERY.

ELECTRIC TRAVELING CRANES AND MACHINES

Those successful concerns whose names are known everywhere in the mechanical and business world are using the following types of cranes and machines designed and built by us:

Electric Traveling Ladle Cranes
Electric Traveling Soaking Pit Cranes
Electric Traveling Stripper Cranes
Electric Traveling Bucket Cranes
Electric Traveling Charging Machines
Electric Traveling Gantry Cranes and Ore Bridges
Electric Traveling Coke Pushers
Electric Traveling Coke Levelers



The accompanying cut shows a 200-ton Electric Traveling Crane designed and built by us for the Carnegie Steel Co.'s Homestead Works, for the Open Hearth and Armor Plate Department. This crane is probably the largest single trolley electric traveling crane in service and is illustrated here to show the capacity of our works for producing large machinery. We make a specialty of cranes for steel works and heavy industrial service.

[illegible] ENGINEERING WORKS

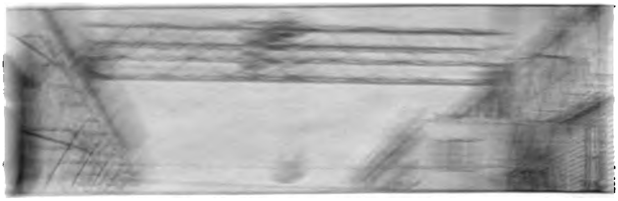
[illegible]

[illegible] HOISTS, ELECTRIC AND [illegible] HANDLING AND HOISTING [illegible]MENT

[illegible] CRANES

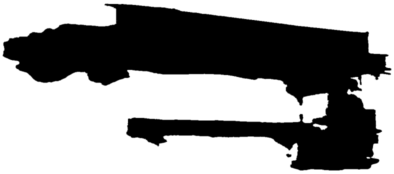
[illegible]

[illegible]



[illegible]

[illegible]



[illegible]

[illegible] the greater portion of our [illegible] Cranes [illegible] Handling [illegible] Electric Hoists [illegible]

THE BROWN HOISTING MACHINERY COMPANY

CLEVELAND, OHIO

New York: 50 Church St.
Pittsburgh: Oliver Bldg.
Chicago: Commercial National Bank Bldg.
San Francisco: Monadnock Bldg.
Colby Engineering Co.: Portland, Ore.

MANUFACTURERS OF BROWNHOIST EQUIPMENT

COAL AND ORE HANDLING MACHINERY—Bridge tramways, fast plants, cantilever cranes, gantry cranes, furnace hoists, larries, transfer cars, bins, car tipples, and pig iron breakers. These machines are designed for the rapid handling of material and a long service. They are installed in many parts of the world.

LOCOMOTIVE CRANES—Eight and four-wheel and for any gauge track; speediest locomotive crane built; equipped with M. C. B. couplers, standard trucks and fittings, steam brake, all steel gears; can be fitted with either a bottom-block, any kind of bucket, shovel attachment, magnet or piledriver, all interchangeable in a short time; easily operated; fitted with steam or electric power or with an internal combustion engine.

BUCKETS—Grab buckets, two and single rope; drag line buckets; contractors' clam shell buckets; slag buckets, and tubs. The designs of these buckets are such that they get a full load each time and are under the control of the operator at all times. The best of material is used throughout, giving strength and durability to the spades, bearings, and digging edges.

TRAMRAIL SYSTEMS—These systems handle all the material overhead, reaching every floor in each building and as much yard space as desired. We install the systems complete using the well-known Brownhoist trolleys, which are recognized as the standard trolleys. Operated by electric or other power.

ELECTRIC HOISTS—DC and AC. Designed especially for a hard service at maximum rated capacity, and for safety. The load is suspended entirely from steel parts. All gears are enclosed in a cast iron casing which contains a large supply of oil. These hoists are made in various capacities.

FREIGHT HANDLING EQUIPMENT. This includes several different machines designed for handling the freight at a much reduced cost over the present methods. The freight is handled overhead from car to sorting platform, warehouse, wagon or other cars. It requires just a few men, eliminates confusion and costly mistakes, and increases the terminal capacity.

FERROINCLAVE. A patented corrugated sheet steel used as a reinforcement for concrete. It requires no forms during erection, and is easily laid by the workmen. It is used for concrete roofs, floors, bins, walls, partitions, silos, bridges, stairs, etc.

We also make overhead travelling cranes, work-car cranes, jib cranes, pillar cranes, bridge cranes, cableways, crabs, winches, transfer tables and water-closet shields.

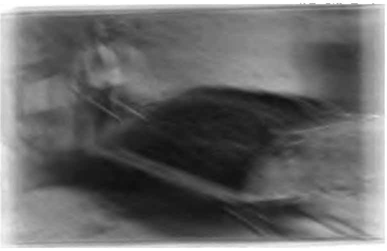
Catalogs and prices furnished on request

[illegible] INC.

[illegible] LAND. [illegible]

[illegible]

[illegible] MACHINERY [illegible] BUCKET CON- [illegible] MACHINERY [illegible] INDUSTRIAL [illegible] LOCOMOTIVES [illegible] CARS, [illegible] SPECIAL SCALES AND WEIGH- [illegible]



[illegible]

Industrial Railway in a Foundry

[illegible]

[illegible] the [illegible] We [illegible] manufacture [illegible] one [illegible]

[illegible] BUCKET CONVEYORS

[illegible] series of [illegible] swinging buck- [illegible] either [illegible] can [illegible] the buck- [illegible] upright [illegible] can be handled. [illegible] system of driving [illegible] of catalog 12-[illegible]

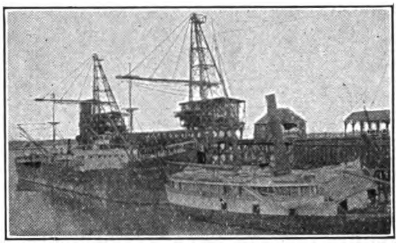
[illegible]

C. W. HUNT COMPANY, INC.

WEST NEW BRIGHTON, NEW YORK

HUNT STEEPLE TOWERS

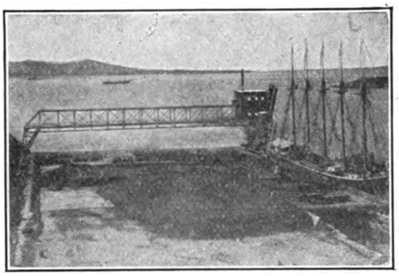
are designed to be operated by one engineer. One engine is required for hoisting the steam shovel and another for running the trolley on the booms. Great speed makes these outfits especially suited to rapid unloading of vessels. The projecting booms are usually hinged to swing horizontally over the wharf. Where obstructions such as the rigging of vessels interfere, the booms can fold up in a vertical plane. Capacity of buckets ranges from ½ to 2½ tons.



Hunt Steeple Towers

HUNT TRANSPORTING BRIDGES

are adapted to the storage and reclaiming of coal over large areas. The one shown has a four-drum equalizing engine and operates with grab buckets at a capacity of 120 tons per hour. Furnished in capacities up to 600 tons per hour.

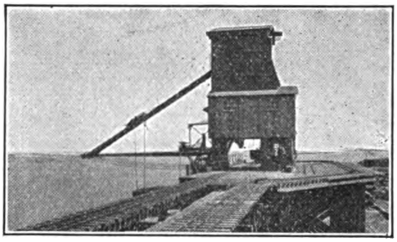


Hunt Transporting Bridges

INCLINED BOOM HOISTING ELEVATORS

are for rapid and economical hoisting of materials from vessels. The bucket, whether large or small, is carried from the hold of the vessel to the dumping place every trip in exactly the same course, and at any rapidity demanded. The bucket is carried exactly where wanted, rising vertically from the hold to the boom, running up the boom, and dumping at a fixed place.

These elevators are proportioned to suit the work and for use either with tubs or grab buckets. The lighter size is especially adapted for coal or ore hoisting, using any size bucket up to one-ton capacity.



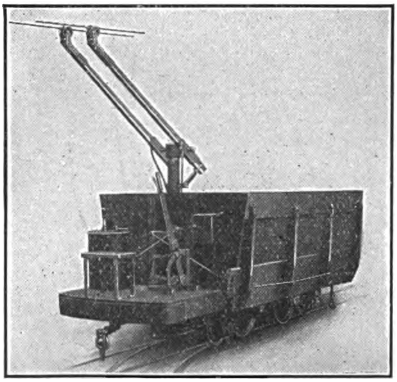
Inclined Boom Hoisting Elevators

HUNT MOTOR CARS

Self-Dumping

made in many types, capacities up to 10 tons, and are equipped with motors and overhead trolleys or shoes for third rail as desired. Suitable for transporting coal, fertilizer materials, ores, and other bulk materials.

Catalogs on request.



Hunt Motor Cars
Self-Dumping

CLYDE IRON WORKS

20th Avenue, West, and Michigan St., DULUTH, MINN.

HOISTING ENGINES, DERRICKS AND DERRICK FITTINGS, ELECTRIC HOISTS, BELT DRIVEN HOISTS, AUTOMATIC BUCKETS

HOISTING ENGINES AND BOILERS OF CLYDE-GRADE

Our product is used for all kinds of Contractor's work, Dredging, Pile Driving, Railroad and Bridge Building, Quarries and general hoisting purposes. We also make a specialty of engines for skidding and loading logs, and for general logging operations.

All our engines are thoroughly tested under steam as well as by the usual hydrostatic test. All parts are made from standard jigs and templates and are absolutely interchangeable.

ONE, TWO, THREE, AND FOUR DRUM HOISTING ENGINES

In our 235 page catalog we illustrate the 2099 types and sizes of our standard engines with single or multiple drums, and single or double cylinders. These hoisting engines are regularly built with or without boiler, winch and sheave heads, and reversing gear. Clyde hoists of 7 x 10 and larger are built with all-steel gears.

DERRICKS AND DERRICK FITTINGS

In this large catalog we also illustrate and list a complete line of timber derricks and fittings. All usual conditions can be met with some one of our standard styles, but we are prepared to build derricks for any special conditions that may arise. For this purpose we maintain a force of draftsmen and engineers who are specialists in this line, and their experience of many years is at the disposal of our customers.

Clyde Derricks are designed with great care to withstand violent strains. Every possible point of weakness, both in the fittings and in their action on the timbers, has been guarded against and we claim our fittings to be the strongest on the market for the size of timbers for which they are intended.

Following is a partial list of our standard styles of derricks:

Standard Guy Derricks
Half Hand Power Guy Derricks
Hand Power Guy Derricks
Clam Shell Guy Derricks
Standard Stiff Leg Derricks
Half Hand Power Stiff Leg Derricks
Hand Power Stiff Leg Derricks
Clam Shell Stiff Leg Derricks
Full Circle Stiff Leg Derricks
Self-Propelling Derrick Cars
Self-Contained Portable Derricks

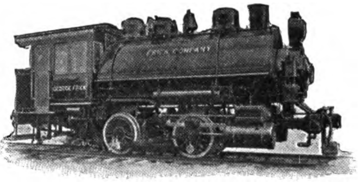
We also manufacture a complete line of logging machinery, of excavating machinery, and of land-clearing machinery.

VULCAN IRON WORKS

WILKES-BARRE, PA.

LOCOMOTIVES, HOISTING AND HAULAGE ENGINES, AIR COMPRESSORS, MINING AND CEMENT MACHINERY.

LOCOMOTIVES



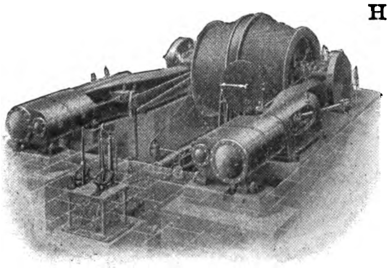
Steam Locomotives. The Vulcan Iron Works make a specialty of, and have excellent facilities for, building locomotives to meet the needs of contractors, steel, mining, and industrial plants; and for plantation, logging, freight, switching and passenger service, in all styles and weights from seven to seventy tons on drivers. A separate and complete plant is devoted to this work.

We also endeavor to keep on hand full detail parts of standard types with a view of making deliveries on short notice. Our stock locomotives can be forwarded on receipt of lettering instructions.

Complete illustrated catalog on request.

Compressed Air Locomotives are adapted to general service in and around coal mines, or industrial plants where a fired locomotive would be dangerous. The dimensions, pressure and capacity of the tanks may be modified to suit special requirements and conditions. For very long runs a separate air tender can be provided, which may be attached or detached as desired. Detailed information on request.

HOISTING AND HAULAGE ENGINES



First Motion Hoists. These engines are built to the most rigid specifications for heavy hoisting work. The drums are of steel or iron, grooved and conical in shape so as to counterbalance the weight of the rope. The illustration shows a type used for shaft hoisting from 300 to 1000 ft. lifts fitted with steam reverse, steam brake, and the Nicholson Engine stop for the prevention of overwinding. Special catalog on request.

Geared Engines. Vulcan Geared Engines are used ordinarily where a hoisting speed of 800 ft. per minute or less is satisfactory, and for some purposes are preferred over First Motion Hoists because of the lesser first cost and of the smaller space occupied. These engines are simple and compact, but have ample proportions in all working parts so as to insure great durability and consequent low cost of maintenance. Special catalog on request.

Vulcan Electric Hoists. Vulcan Electric Hoists are built in standard sizes from 35 to 250 H.P. and with single or double drums. Special hoists will be designed to meet special conditions as may be required. If desired the equipment includes solenoid brakes and a device for the prevention of overwinding.

MACHINERY FOR THE MANUFACTURE OF PORTLAND CEMENT

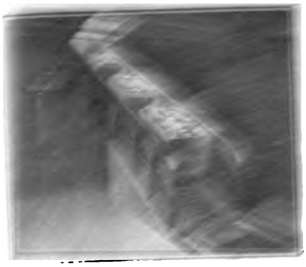
We build Kilns for either the dry or wet process, and of any size to suit the needs or ideas of the customer. Although our specialty is rotary kilns, dryers and coolers, we also build engines, boilers, stacks, bins, sheet iron work of all kinds, conveying and elevating machinery, and other machinery used in or around the Modern Portland Cement Plant.

Catalog on request.

[illegible] PANY

[illegible] ELEVATORS

[illegible]



[illegible] Inclined Transfer

[illegible]

Special Inclined Elevator

[illegible] handling. Installed in [illegible] Works, Hartford, Conn. [illegible] 300 to 450 lbs. each. Roll off [illegible] at top. Operated by a 5 H. P. [illegible] motor at speed of 30 ft. per minute. This particular type would be suitable for handling coils of wire or similar material.

[illegible] Inclined Elevator is particularly adapted to the varied merchandise [illegible] parcels in express offices and railroad stations; freight to [illegible] bags, bales, boxes and packages in stores and ware-[illegible] parts, or merchandise in process of manufacture in [illegible] Catalogue on request.

INCLINE RAILWAYS

Commercial Inclines

[illegible] Plant

In this class are included Incline Hoisting outfits used in industrial enterprises for various purposes, such as hoisting cement, stone, ore and coke at quarry or blast furnace—their uses are unlimited. Where the incline is short and the load heavy the Drum type of spur-geared machine is used. The rope is not permitted to overwind on the drum. Where the distance is greater we specify the Traction type of hoisting machine.

Traffic and Tourist Inclines

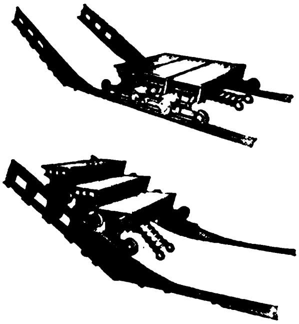
The Otis Traffic Incline Railways [illegible] with steep grades which seriously [illegible] the [illegible] public and teaming traffic. Our Tourist or Passenger [illegible] operation at the well known resorts of [illegible] the country [illegible] Catalogue on request.

OTIS ELEVATOR COMPANY

ESCALATORS

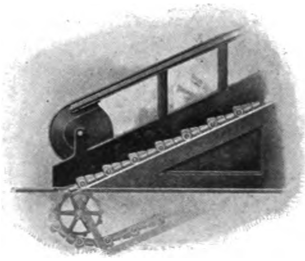
The problem of inter-floor travel, where it is necessary to keep thousands of people moving constantly and rapidly, has been successfully solved by the Escalator, due to its continuity of motion and its enormous capacity—approximately 11,000 people can be carried in an hour without overloading the machine.

There are two types of Escalators, known as the Step and Cleat types. The Step type begins as a moving platform, rising slowly into a perfect staircase as it breaks into steps. The Cleat type is an endless moving platform formed of hardwood cleats located in longitudinal ridges and grooves.



Step Type

As shown above, on the landing the treads are flush—the passenger stepping onto them from a stationary floor plate. Approaching the incline a step formation is produced and on the incline, the full riser development. At the upper end, the reverse action takes place and the steps flatten out into a moving platform again, from which the passenger alights smoothly to the stationary floor.



Cleat Type

The step treads are nearly horizontal—at an angle of 12½ degrees. The platform revolving over the sprocket glides through the prongs of a comb at the lower level and journeys upward at a moderate speed. At the upper landing it disappears through a comb and revolving over a sprocket, travels downward. The passenger slides off upon the prongs of the comb at top without jar or shock.

In each type, on either side, a hand rail of flexible material moves upward at the same speed as the treads. An electric motor drives the mechanism running on rollers on an inclined plane, which supports the treads. The Escalator can be made to operate either up or down by employing a reversing switch. The Duplex Escalator handles traffic in both up and down directions simultaneously, two machines being used.

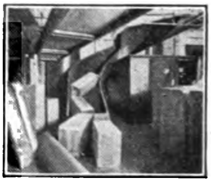
Escalators are now being operated in large railway terminals, elevated and subway stations of the big cities, theatres, department stores, and in large mills and factories.

The cut shows two of the eight Step Type Escalators installed in the largest worsted mill in this country. The eight escalators carry 6,500 operators between the 2nd and 6th floors, moving noon and night. Individual trip from 2nd to 6th floor consumes two minutes. The machines are motor driven and can be started, stopped and reversed at will. They operate a total of one hour per day, low motor powers being used, and the annual operating costs are very small. In the course of a year a large sum of money is saved through the conserved energy of the employees. Catalogue on request.

GRAVITY SPIRAL CONVEYORS

For moving speedily and safely heavy cases, barrels, and bulky factory products from an upper level or floor to a lower level. Provided with chain and fusible link doors which close automatically in case of fire. We have installed conveyors of this type which are handling the products of 10 floors.

Made with single and double spirals, with or without a supporting core. Closed types are made with single, double and triple spirals. Booklet on request.



Open Spiral Type

THE ELWELL-PARKER ELECTRIC CO.

CLEVELAND, OHIO

Lucian C. and G. W. Brown, General Sales Agents, 50 Church Street, New York City

DISTRICT SALES AGENTS

F. W. Ward
1401 Park Bldg., Pittsburg, Pa.

Jos. M. Brown
31 W. Kinzie Street, Chicago, Ill.

MANUFACTURERS OF BUCKWALTER ELECTRIC TRUCKS

ECONOMICAL FREIGHT HANDLING

As fairly representative, the following average results have been extracted from records obtained during one month's operation of two out of a number of our freight car trucks owned and operated by one of the leading railroads in the United States, handling miscellaneous freight.

Monthly Totals

Total number of:		Total number of:	
days operated	26	tons handled	5,850
hours operated	286	loads carried	5,980
miles run	353.6	pieces handled	170,000

Daily Averages

Number of hours in service	11	Time running per load, sec.	59
Daily mileage	13.6	Time per load, min.	2.89
Per day tonnage	225	Time to load, sec.	58
Per hour tonnage	20.4	Time to unload, sec.	60.3
Number of loads	230	Number of men in gang	8
Length of haul in feet	158.5	Wages per man, tonnage basis	$2.40
Number of pieces per load	30	Ampere hour charge	160

Summary

$.087	cost per ton for Labor
.0039	cost per ton for Power
.0033	cost per ton for Maintenance
.0099	cost per ton for Interest, Depreciation, etc.
.1041	total cost per ton for Freight Handled.

RAILROAD FREIGHT TRUCKS

The following illustrations show two of our various types:

Freight Car Truck

Warehouse Truck

General Specifications—Freight Car Truck

Capacity	4,000 pounds	Height floor to lower platform	10¾ in.
Speed, empty	7 to 8 M.P.H.	Height floor to upper platform	3 ft. 9½ in.
Speed, loaded	5 to 6 M.P.H.	Height over stakes	3 feet
Weight, with lead battery	1,900 pounds	Width over body, motor end	42 inches
Weight, with Edison battery	1,750 pounds	Width over body, rear end	36 inches
Length over body	7 feet		

General Specifications—Warehouse Truck

Capacity	4,000 pounds	Height, floor to upper platform	3 ft. 9½ in.
Speed, empty	7 to 8 M.P.H.	Height, floor to lower platform	1 ft. 4¾ in.
Speed, loaded	4 to 5 M.P.H.	Height over stakes	48 inches
Weight, with lead battery	1,900 pounds	Width over body, motor end	3 ft. 2 in.
Weight, with Edison battery	1,600 pounds	Width over body, rear end	3 ft. 1 in.
Length over body	10 ft. 2 in.	Width over hubs	39 inches

THE RAIL JOINT COMPANY

GENERAL OFFICES:

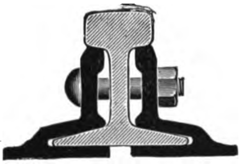
185 MADISON AVENUE, - NEW YORK CITY

Catalog at Agencies

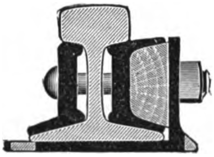
Boston, Mass. Pittsburg, Pa.
Chicago, Ill. Portland, Oregon
Denver, Colo. St. Louis, Mo.
Troy, N. Y.

London, E. C., Eng. Montreal, Can.

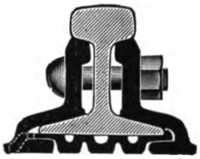
MAKERS OF BASE-SUPPORTED RAIL JOINTS FOR STANDARD AND SPECIAL RAIL SECTIONS, ALSO GIRDER, STEP OR COMPROMISE, FROG AND SWITCH, AND INSULATED RAIL JOINTS, PROTECTED BY PATENTS.



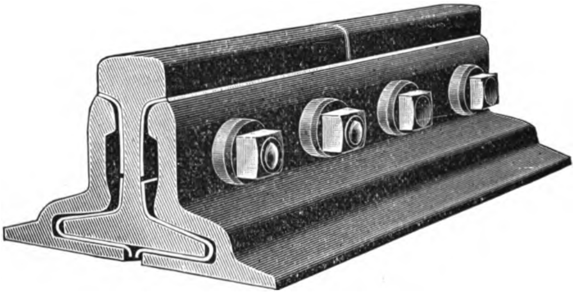
Continuous Joint



Weber Joint

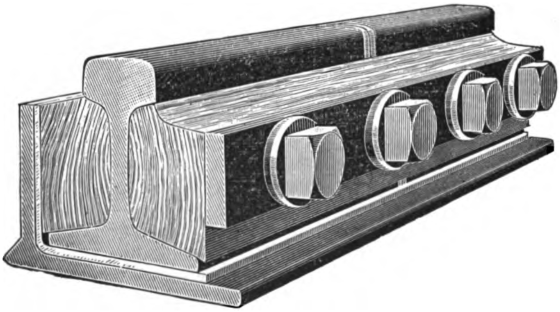


Wolhaupter Joint



Continuous Insulated Joint

Over
50,000
miles
in use



Weber Insulated Joint

Rolled
from
Best Quality
Steel

Highest Awards—Paris, 1900; Buffalo, 1901; St. Louis, 1904.

[illegible] Machinery

THE AJAX MANUFACTURING CO.

CLEVELAND, OHIO

[illegible] Office—
[illegible] Bldg.

MANUFACTURERS OF HOT METAL WORKING MACHINERY

[illegible] BOLT HEADING, UPSETTING AND FORGING MACHINES
With Stop Motion Device

[illegible] bolts and all sorts of other upset forgings. [illegible] the size of bolt which they are capable [illegible] size and larger are geared [illegible] gears and [illegible] Ajax Forging Machines are built with [illegible] Rods over Die and [illegible] Slides. Also [illegible] bound head that cannot be [illegible] mechanism or Automatic Stop-Motion [illegible] Clutch.

[illegible] MOTION HEADING MACHINES

[illegible] Bolts and products of a similar [illegible] casting. Extra large Bearings [illegible] insuring proper lubrication. [illegible] STANDARD HAND [illegible] the ordinary [illegible] operate [illegible] Ajax [illegible] Bolts [illegible]

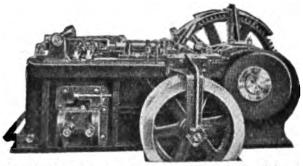
[illegible] MACHINES

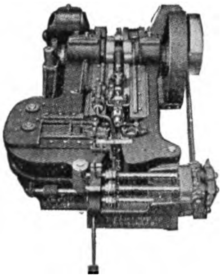
[illegible]

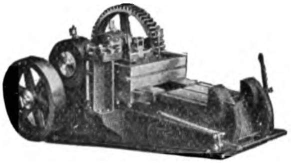
THE AJAX MANUFACTURING CO.

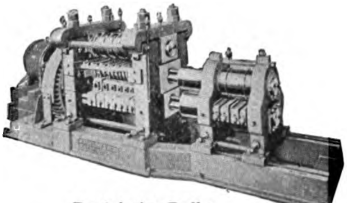
DETAILED TABLE OF FACTS CONCERNING AJAX MACHINES

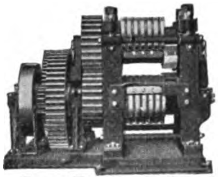
Machines		Sizes	No. Strokes Per Minute	Floor Space Without Back Stop	Diam. Blt. W.	Face Blt. W.	
Bolt Heading, Upsetting, and Forging Machines		7"	26	20' 4" x14' 6"	75½"	13"	
		6"	30	19' 0" x13' 9½"	75½"	13"	
		5"	35	15' 0" x12' 0"	58"	11"	
		4"	40	13' 4" x 7' 9"	56"	11"	
		3½"	50	11' 4" x 7' 4½"	42"	11"	
		3"	55	11' 0" x 6' 6"	40"	11"	
		2½"	60	9' 8" x 6' 4"	40"	11"	
		2"	70	9' 5" x 6' 0"	40"	9"	
		1½"	75	8' 4" x 5' 2"	33"	6½"	
		1¼"	80	7' 8" x 4' 6"	51"	7½"	
		1"	90	7' 4" x 4' 5"	48"	6"	
		¾"	100	7' 0" x 4' 0"	48"	6"	
Universal Upsetting and Forging Machines		6"	30	14' 2" x19' 3½"	75½"	13"	
		5"	35	13' 8" x12' 9"	58"	11"	
		4"	40	13' 6" x10'10"	56"	11"	
		3½"	50	11' 7" x 8' 9"	40"	11"	
		2½"	60	9'11" x 8' 4"	40"	11"	
		1½"	75	8'11" x 7' 5"	40"	7"	
Continuous Motion Heading Machines	Hand Feed	1¾"	45	12' 6" x 7' 0"	60"	9"	
		1½"	50	10' 5" x 6' 4½"	60"	8½"	
		1¼"	65	8' 9" x 6' 0"	53"	8½"	
		1"	70	8' 0" x 5' 1"	50"	7"	
		¾"	85	7' 0" x 4' 4"	48"	6"	
		½"	85	6' 8" x 4' 0"	48"	6"	
	Automatic	1¾"	60	12' 5" x 6' 4½"	60"	8½"	
		1½"	85	10' 9" x 6' 0"	53"	8½"	
		1¼"	90	10' 0" x 5' 1"	50"	7"	
		1"	100	9' 0" x 4' 4"	48"	6"	
		¾"	105	8' 8" x 4' 0"	48"	6"	
Ajax Special Axle Upsetting Machines		4"	40	13' 4" x 7' 9"	56"	11"	
		3½"	50	11' 4" x 6' 7"	42"	11"	
		3"	55	11' 0" x 6' 6"	40"	11"	
		2½"	60	9' 8" x 6' 0"	40"	11"	
		1½"	75	8' 4" x 5' 2"	33"	6½"	
Bulldozers or Bending Machines	Standard Slow Speed	No. 12	7	22'11" x10' 1"	36"	8½"	
		No. 9	8	19'10½"x 8' 5"	32"	6½"	
		No. 8	8	18' 6¾"x 8' 0"	32"	6½"	
		No. 7	9	15'10" x 7' 0"	26"	6"	
		No. 6	10	13' 8" x 5' 8"	26"	6"	
		No. 5	11	13' 4" x 5' 1"	26"	6"	
		No. 4	12	12' 2" x 4'10"	26"	6"	
		No. 3	17	9'11" x 4' 2"	18"	4"	
	Stop Motion High Speed	No. 7	30	16' 1½"x 7' 3"	32"	7"	
		No. 6	35	15' 0" x 6' 4"	30"	7"	
		No. 5	40	13' 2½"x 5' 9"	40"	8½"	
		No. 4	45	10' 6" x 3'10"	34"	6½"	
		No. 3	50	10' 0" x 3' 6"	32"	5½"	
		No. 2	60	8' 0" x 3' 0"	26"	4¾"	
		No. 1	60	4'11½"x 2' 2"	20"	3½"	
Hot Pressed Nut Machines		2"	45	12' 0" x 6' 0"	48"	10"	Geared
		1½"	50	11' 6" x 3'10"	40"	7"	
		1¼"	55	11' 2" x 3' 8"	45"	6½"	
		1"	60	10'11" x 3' 6"	33"	6½"	
		¾"	65	9'10" x 3' 3"	53"	6½"	
Ajax Rolls	Taper-Forging	No. 4	28	8'11" x 7' 8"	54"	8½"	
		No. 3	30	7'11" x 6'10"	54"	8"	
		No. 2	38	6'10" x 5'10"	44½"	6½"	
		No. 1	50	6' 4" x 5'10"	44½"	6½"	
		No. 0	50	4'10" x 3' 8"	33"	5"	
	Brake Shoe Key Taper-Forging	Special	50	4'10" x 3' 8"	33"	5"	
	Reclaiming	Trio	75	17' 6" x 7' 6"	40"	8½"	
Ajax Hot Saw and Burring Machines		14"	2,000	2' 7" x 2' 11"	6"	4"	
		20"	1,400	3' 3" x 3' 1½"	8"	5"	
		30"	725	3' 8½"x 4' 2½"	9½"	5½"	

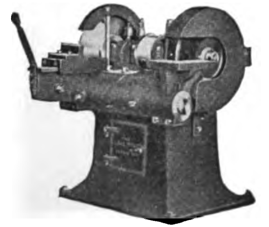

Bolt Heading and Forging Machine


Automatic Feed Heading Machine


High-Speed Bulldozer


Reclaiming Rolls


Taper-Forging Rolls


Hot Sawing and Burring Machine

S[illegible] S[illegible]ETH COMPANY

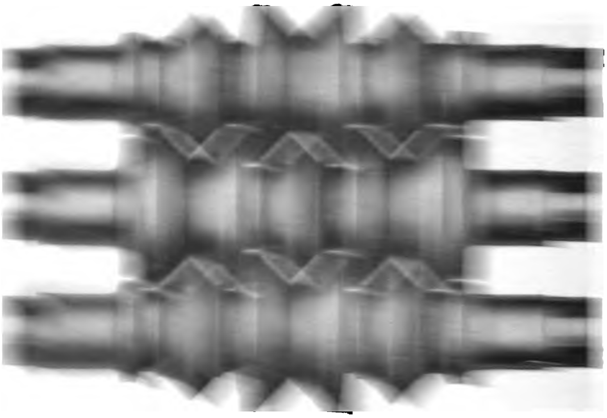
[illegible] PITTSBURGH, [illegible]

MANUFACTURERS [illegible] OF PATENT [illegible]
[illegible] ROLLS AND PINIONS; STEEL ROLLS AND PINIONS

[illegible] AND PINIONS FOR ROLLING MILL MACHINERY

[illegible]

[illegible]



[illegible]

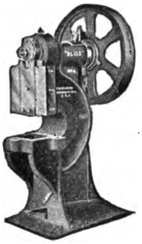
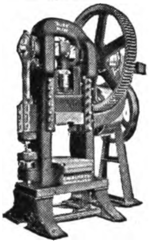
[illegible] advantage.

[illegible] large number [illegible] in [illegible] sketch [illegible] parties coming [illegible] sections. We

E. W. BLISS CO.

BROOKLYN, N. Y.

BUILDERS OF SHEET METAL WORKING MACHINERY

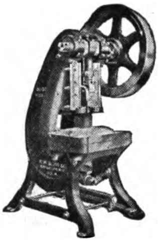
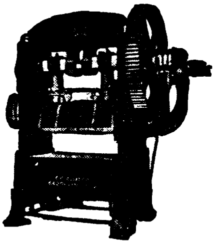
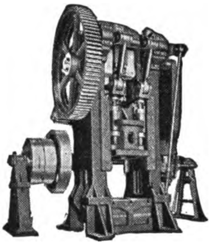
The most complete line of machines for sheet metal working in the world.

Presses for every ordinary kind of work and special machines for unusual requirements. Drop Forging machinery, Hinge and Butt machinery, Fork and Spoon machinery, Expanded Metal Lath machinery, Shovel machinery, Horse Shoe machinery, Minting machinery, Automobile Parts machinery, Spinning Lathes, Gang Slitters, Circle Shears, Perforating, Punching, Slitting, Shearing, Beading, Flanging, Crimping and Seaming machines.

Complete equipments for the economical manufacture of Petroleum and Alcohol Cans, Fruit and Vegetable Cans, (Sanitary and Packers'), Meat Cans, Paint and Varnish Cans, Lard Pails and Butter Tins, and all kinds of Tin Cannisters, Boxes and Packages.

Machinery for manufacturing Soft Metal Tubes, Tinware, Enamelware, Aluminum, and Silverware, Metal Shingles, Metal Ceilings, Sheet Metal Furniture, Kitchen Utensils, Kitchen Boilers, Oil Stoves, Lamps, etc., etc.

We are also equipped for die work of every description.

Catalogues describing any of our lines will be sent on request

No. 1. "Bliss" Inclinable Power Presses.
No. 2. "Stiles" Power Punching Presses.
No. 3. "Bliss" Straight-Side Power Presses.
No. 4. "Bliss" Drop Hammers and Trimming Presses.
No. 5. "Bliss" Toggle Drawing Presses and Spinning Lathes.
No. 6. "Bliss" Foot and Screw Presses.
No. 8. "Bliss" Double Crank Presses.
No. 9. "Bliss" Machinery for Manufacturing Tin Cans (Spanish).
No. 10. "Bliss' Machinery for Manufacturing Pieced Tinware.
No. 11. "Bliss" Minting Machinery.
No. 12. "Bliss" Machinery for Manufacturing Electrical Parts.
No. 13. "Bliss" Drop Forging Machinery.
No. 14. "Bliss" High Speed Automatic Can Making Machinery.
No. 15. "Bliss" Railway Motor Gears and Pinions.
No. 16. "Bliss" Machinery for Manufacturing Automobile Parts.

WILLIAMS, WHITE & CO.

[illegible]

Chicago Office
2 . Monadnock Block

FORGING, [illegible] AND SHEARING MACHINERY
COALING STATIONS

[illegible]

THE ORIGINAL BULLDOZERS

[illegible] years of manufacture [illegible] a high powered horizontal Press [illegible] large die surface [illegible] uniformity for [illegible] bending. They are [illegible] number of [illegible] — the most general purposes in existence. The in[illegible] die maker has an [illegible] here. Upsetting is [illegible] satisfactorily with an [illegible]; punching and [illegible] of special shapes also. [illegible] railroads and agricultural [illegible]

[illegible]

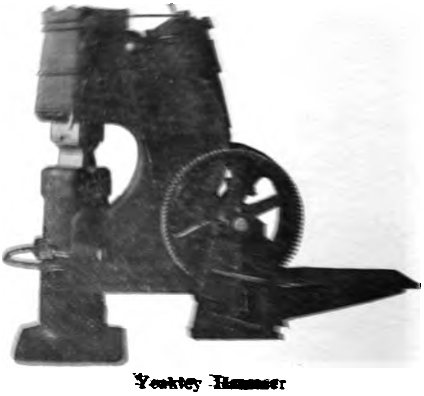
[illegible]

HAMMERS

The Yeakley Hammer: Recent important improvements place this hammer at the head of all forging hammers both in power and control. The output as well as durability is [illegible]. Exceptionally [illegible]. Speed is [illegible] for both light and heavy [illegible] about [illegible] and the present [illegible]

The following sizes are built: 40 lb., [illegible] lb., 150 lb., 400 lb. and 600 lb.

Readily adapted to motor drive.



Yeakley Hammer

Board Drop Hammer

The Justice Spring Hammer: Is a well known type. Fine [illegible] Silico Manganese Steel Springs furnished.

The "Moline" Helve Hammer: There is a certain class of work for which the Helve Hammer is particularly suited.

Details furnished on application.

Board Drop Hammers: The feature of these hammers to which we call particular attention is the exceptional ease of operation and large output. In all respects these hammers are up to the highest standard.

Crank (or Rope Lift) Drop Hammers: These hammers [illegible] with comparatively small up-keep [illegible]. While [illegible] adapted to fine drop forgings they are particularly adapted to the [illegible] of large dies for [illegible] forming and straightening.

We [illegible] Sanding [illegible] Ratchet and [illegible]

WILLIAMS, WHITE & CO.

MULTIPLE PUNCHES

These machines constitute one of our largest lines. We make nine sizes with a variety of lengths and throats. Many special types and adaptations for special work are furnished. See our special double row punching outfit for steel car work.

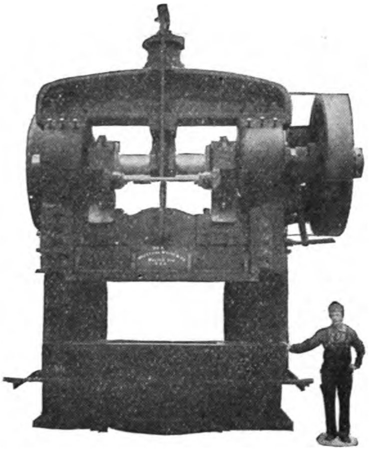
One of our customers alone has more than thirty of the No. 32 size. The larger sizes are used more particularly for steel car work.

These machines range in weight from 5000 lbs. to 250,000 lbs.

They are used for multiple punching of bars, plates, I-beams, Channels, Angles, car sills, etc., etc. Also for shearing and pressing. For the latter work a vertical adjustment is desirable.

The purchaser should furnish complete details of requirements.

Gate Shears: We make a complete line of Gate Shears for shearing plates.

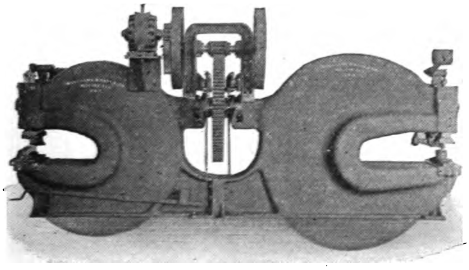


Multiple Punch

PUNCHING AND SHEARING MACHINES

Regular "C" Type Double and Single End Machines, Open Fronted Bar Shears, Guillotine Shears, Gate Shears, Coping and Structural Punches and Shears

We make a complete line of the above machines.



"C" Type Double End Punch and Shear

Regular standard "C" type double and single End Punches and Shears: a complete line of sizes with various depths of throats, types of jaws and equipment.

Catalog furnished on request containing details and specifications.

Multiple Head Tapping Machines,—For tapping pipe fittings, all sizes up to 8″ and 10″ fittings.

In addition to machines mentioned above our line includes the following:

Upsetting Forging and Rivet Machines
Eye Benders
Bending and Straightening Machines
Horizontal Punches
Hydraulic Presses
Stay Bolt Breakers
Rotary Riveting Hammers
Hydraulic Plate Benders
Angle Bending Rolls
Angle Shears

Making as we do a complete line of Punching, Shearing, Forging and Bending Machines, Eye Benders, Forging Rolls, Power Hammers and Drop Hammers, we are often called upon in an engineering or advisory capacity to recommend and select the machines adapted to produce the required article or shape. Our long experience with all these machines, and consultations with our experts are at the disposal of those interested.

COALING STATIONS FOR COALING LOCOMOTIVES

VULCAN ENGINEERING SALES CO.

2007 Fisher Bldg.
CHICAGO, ILL.

No. 30 Church St.
NEW YORK, N. Y.

CONTROLLING ENTIRE SALES AND PRODUCT

MUMFORD MOLDING MACHINE CO.

JOLT RAMMING MACHINES
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SPLIT PATTERN MACHINES

HAND AND POWER SQUEEZERS

PNEUMATIC VIBRATORS

FOUNDRY MOLDING MACHINERY AND EQUIPMENT

HANNA ENGINEERING WORKS

PNEUMATIC RIVETERS

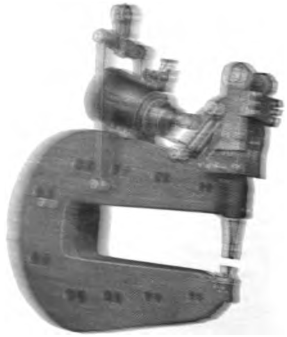
From 5 in. reach x 6 in. gap, 20 tons pressure, to 26 in. reach x 24 in. gap, [illegible] tons pressure.

PLAIN TOGGLE, Direct Air, AND COMPRESSION LEVER RIVETERS

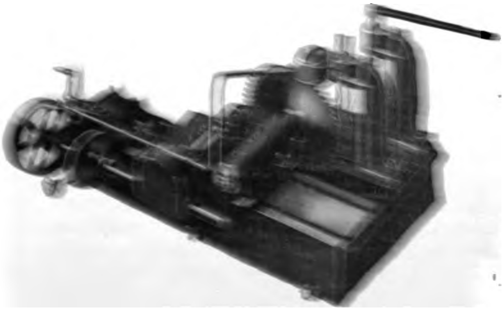
SAND SHAKERS

DUMPING LADLES

ELECTRIC OSCILLATORS



THE Q M S COMPANY



COLD METAL SAWING MACHINERY

Saws for Cold Cutting Off.
For Foundry, Structural and Machine Shop.
Power Hack Saws.

TRAVELING CRANES

PNEUMATIC HOISTS

I-BEAM TROLLEYS

GENERAL SHOP EQUIPMENT

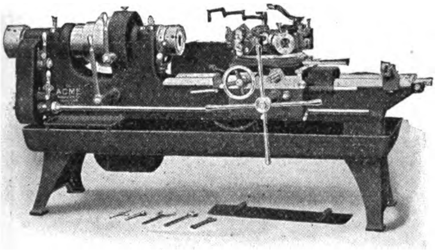
Complete Catalog of All Machines on Request

THE ACME MACHINE TOOL COMPANY

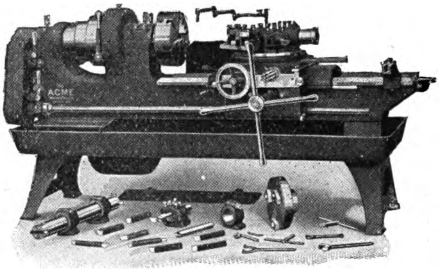
CINCINNATI, OHIO, U. S. A.

Code Word, ACME *Lieber's Code*

MANUFACTURERS OF THE ACME COMBINATION FLAT TURRET LATHE, THE CINCINNATI ACME TURRET SCREW MACHINES, TURRET LATHES, BRASS WORKING MACHINES AND UNIVERSAL TURRET LATHES AND ALL TOOLS AND ATTACHMENTS FOR THESE MACHINES.



2¼″ x 26″ C. F. T. L. with Bar Equipment

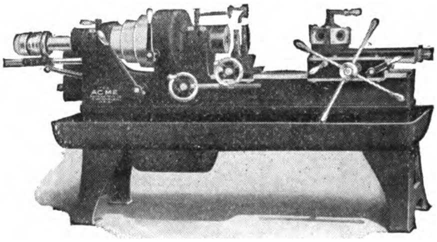


2¼″ x 26″ C. F. T. L. with Chucking Equipment

THE ACME COMBINATION FLAT TURRET LATHE

The double purpose machine; adapted to both bar and chucking work. Using simple, inexpensive tools. The greatest producer of work from bar stock, forgings and castings, accommodates bar stock up to 2¼″ dia. x 26″ long and forgings and castings 12″ diameter.

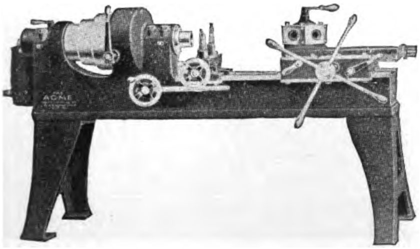
(SEND FOR SPECIAL BULLETINS)



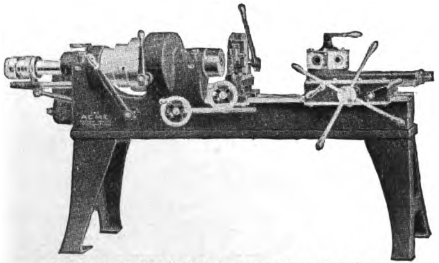
2¼″ x 11″ Screw Machine

TURRET SCREW MACHINES

Made in five sizes. Automatic chuck capacity ⅝″ to 2¼″, 11″ to 20″ swing. Plain or friction geared head with or without automatic feed to turret. Built to meet the demand for maximum production. Noted for their accuracy, rigidity, convenience to operator and many other superior features.



18″ Friction Geared Head Turret Lathe



18″ Turret Lathe with Forming Attachment

TURRET LATHES AND BRASS WORKING MACHINES

Made in four sizes, 14″ to 20″ swing. Plain or friction geared head, with or without automatic chuck, bar feed, automatic feed to turret, or cut off rest. Furnished with plain, set over or universal turret, also chasing attachment, forming attachment and all tools for rapid and accurate production.

Special tool equipment and estimates of production furnished on request.

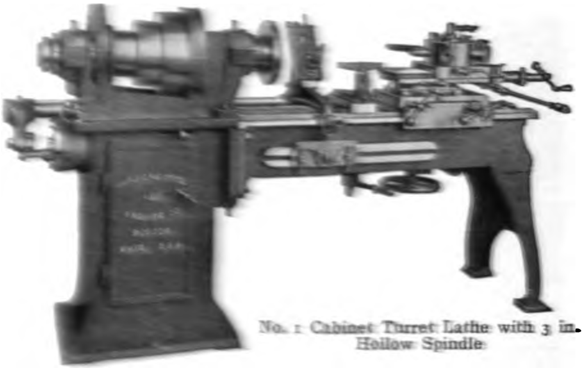
MACHINES OF QUALITY **SEND FOR DETAILS**

THE AMERICAN TOOL & MACHINE CO.

[illegible]

[illegible] MASSACHUSETTS, U. S. A.

LATHES, VALVE MILLING MACHINES, OIL SEPARATORS



No. 1 Cabinet Turret Lathe with 3 in. Hollow Spindle

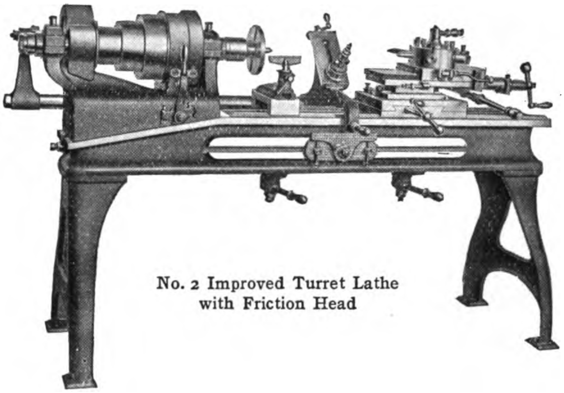
Turret Lathes [illegible] heavy brass and iron work, and [illegible] forward motion of the turret can be accelerated by simply throwing the lever, and so is available instantly for either quick [illegible]

Cabinet Turret Lathes No. 1 and 2: These lathes are exceedingly compact [illegible] especially suited for general service on [illegible] boring taper holes with power feed. No. 2 [illegible] hollow spindle.

[illegible] illustrations and specifications of lathes, [illegible] request.

No.	[illegible]	[illegible]	Spindle	Swing	Fitted with		
					Back Gears	**Screw Apparatus**	**Taper Attachm't**
			TURRET LATHES.				
[illegible]	[illegible]	[illegible]	hollow	[illegible] in.			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		..	..
	[illegible]		[illegible]	[illegible]	..	..	..
			CABINET TURRET LATHES.				
[illegible]		[illegible]	hollow,	[illegible] in.	..	..	..
[illegible]	[illegible]	[illegible]	Hollow	[illegible] in.	.	..	..
[illegible]	[illegible]	[illegible]	Solid	[illegible] in.	.	..	..
[illegible]	[illegible]	[illegible]	[illegible]	[illegible] in.	.	..	..
			IMPROVED TURRET LATHES.				
[illegible]	[illegible]	[illegible]	hollow,	[illegible] in.	.	..	..
[illegible]	[illegible]		hollow,	[illegible] in.	.	..	..
			IMPROVED LATHE.				
[illegible]	[illegible]	[illegible]	hollow,	[illegible] in.	..	..	..
			SQUARE ARBOR LATHE.				
[illegible]	[illegible]	[illegible]	Solid	[illegible] in.	.	..	....
[illegible]	[illegible]	[illegible]	[illegible]	[illegible] in.		..	
			[illegible] AND BACK MOTION LATHES.				
[illegible]	[illegible]	[illegible]	[illegible]	[illegible] in.			
[illegible]	[illegible]	[illegible]	[illegible]	[illegible] in.			

THE AMERICAN TOOL & MACHINE CO.



No. 2 Improved Turret Lathe with Friction Head

Improved Turret Lathe: The headstock can readily be adjusted to a level with that of the tail stock. The hollow spindle has a thrust bearing that runs continuously in oil, thus relieving the spindle of friction and wear.

Headstock fitted with self-oiling, hard metal, bronze boxes with hardened steel thrust and take-up, washers and adjustable caps.

Tailstock fitted with swivelling arrangement and quick motion device to top slide.

Screw apparatus, Fox design with six point star follower, hob spindle revolves at half the speed of live spindle, insuring a strong and durable leading thread.

Friction Head: For work requiring widely different speeds in its several operations, a friction head, so called, has been designed. This combination enables the operator to use slow or back gear speeds by changing a lever.

OIL SEPARATORS

Belt Driven

Made in two sizes. No. 1 has a capacity of 520 cubic inches, and will separate in from five to eight minutes, the time being regulated by the condition and quality of the oil used.

These same conditions apply to the No. 2 or larger machine, which has a pan capacity of 2,540 cubic inches, and is proportionately heavier and stronger. The time required to separate with the No. 2 is practically the same as with the No. 1, provided both are running at the same peripheral speed. The No. 2 separator (see cut), having about five times the capacity of the No. 1, is better adapted to bulky, light-weight chips or turnings, but is equally effective on ordinary work.

Electrically Driven

The No. I separator is also mounted and geared for electric driving. Electric power is now in such general use for machine-shop work that this type of separator meets a demand from shops so equipped.

Direct Current Motors furnished for any voltage.

No. 2 Oil Separator

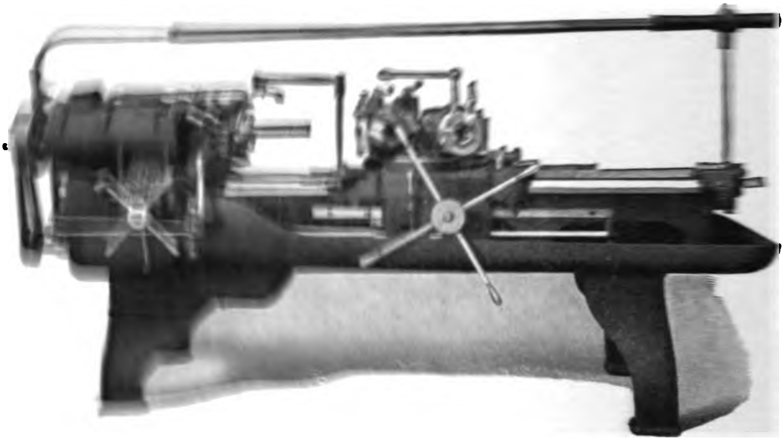
JONES & LAMSON MACHINE COMPANY

SPRINGFIELD, VERMONT, U.S.A.

[illegible]

PROFIT PRODUCING MACHINES FOR LATHE WORK

THE HARTNESS FLAT TURRET LATHE



[illegible]

The Hartness [illegible] which was originally designed for bar work exclusively [illegible] as a machine for Chucking Work. This drift [illegible] of the Cross Sliding Head[illegible], for by this feature its [illegible] without departing from the [illegible] was accomplished by the unusual [illegible] thereby gaining a double [illegible] the ideal feature of Single [illegible]

The Single S[illegible] the most absolute control of the work and tool. It [illegible] other schemes which have had [illegible] slides between the tool and the bed casting.

On this plan has been carried forward the success of the Flat Turret Lathe which [illegible] the success of which we humbly acknowledge [illegible]

All through these years we have aimed to build a machine on ideal lines, both mechanically and economically [illegible] ourselves and our customers. Our claim has been se[illegible] Machine Building for Profit and our machines have been described [illegible] Hartness Manual of the Flat Turret Lathe. Although these books were [illegible] advertising mediums the facts were stated with the best degree of impartiality that could be held by earnest advocates.

Our Flat Turret Lathe today stands without a rival as the machine that gives the best independent control of work and tool, (and you know that tool is the [illegible]

JONES & LAMSON MACHINE COMPANY

SPRINGFIELD, VERMONT, U. S. A.
77 Queen Victoria St., London, England

COST REDUCING MACHINES FOR LATHE WORK

THE HARTNESS FLAT TURRET LATHE

Single Spindle Type

essential feature of a lathe for chuck work; if it were not, then you could do all your chuck work on a drill press at a great saving in cost of installation and labor cost per piece).

It is the only machine that combines high efficiency with adaptability. (The adaptability is the essential feature in any plant in which there is a progressive change in the design of its product. It is the feature that facilitates getting the work done when it is wanted. It is the feature that keeps down the cost of special tools, the immense capital tied up in parts, and the loss entailed by that large stock when on account of progress in design these parts have become obsolete.)

It is the simplest machine. (Simplicity cannot be overrated. The problems of the engineering world are intricate beyond the reach of the human mind, and any machine that is needlessly complex is a hindrance to progress. A simple machine for accomplishing an important work is one of the greatest blessings of the present day. It eliminates the worry about how to do the work. It facilitates the comprehension of the process. It brings the machine within the reach of the workman's understanding without his having to study a lifetime to know how to use it. In fact the simple machine is the machine of greatest value provided it meets the economic conditions.)

It likewise possesses many other unique characteristics which were most easily acquired in the development of this type of lathe. Easy, because we were the first in the field, and we took the natural means and selfishly patented them. This has not led to a public loss. It has led to the production of the greatest number of these machines by one manufacturer and this has made it possible to give a machine of the highest value at the lowest price. Machine builders know what gains can be made by this process, yet even they are frequently chagrined at our success.

But all these facts are well known to our friends who have bought our machines, and many of our friends who have bought others. **Just now, however, we are announcing something that may not be generally known.**

WE HAVE MADE TWO NEW DEPARTURES

First, we are making the Flat Turret Lathe in two styles. The Regular style you know well. (It is made in two sizes. The smaller one is called the $2\frac{1}{4}$ x 24 size. It handles bar work up to $2\frac{1}{4}$ inches diameter of the bar from which the work is turned, and chuck work up to 12 inches in diameter and from 1 inch to 8 inches or 12 inches long, according to the character of the piece. The larger one is known as the 3 x 36 Flat Turret Lathe, and it handles bars up to 3 inches diameter, and chuck work up to 14 inches and from 1 inch thick to 12 inches or 18 inches long, according to the character of the piece.)

[illegible] MACHINE COMPANY

[illegible]

[illegible] MACHINES FOR LATHE WORK

[illegible] SPINDLE FLAT TURRET LATHE

[illegible]

[illegible] Spindle Flat Turret Lathe. [illegible] single spindle [illegible] inch [illegible] diameter. [illegible] invest- [illegible] or this [illegible]

[illegible]

[illegible]

JONES & LAMSON MACHINE COMPANY

SPRINGFIELD, VERMONT, U. S. A.
77 Queen Victoria St., London, England

COST REDUCING MACHINES FOR LATHE WORK

THE DOUBLE SPINDLE FLAT TURRET LATHE

The advantages of the Double Spindle Flat Turret Lathe will be found to be many on many kinds of work, but of course it is designed more for manufacturing conditions of large repetition work than for conditions which call for quick change and small lots.

It gains its advantage over all other means not only on account of its double cuts of a kind, but **it combines with the double spindle the advantages that go with a hand-operated lathe,**—such as highest cutting speeds and feeds. These, of course, cannot be attained by an automatic machine that is not constantly under the watchful eye of the operator. The difference in speeds makes an important difference in output.

The Double Spindle Lathe also requires a little more care in setting the second set of tools so that they may act in harmony with the first set, but even this is minimized by the auxiliary adjustment provided for many of the tool holders; and another restriction is that with this doubling of tooling there is necessarily some restriction of the range of work, but it is nothing compared with the natural restrictions of other machines that are offered for manufacturing conditions. **Hence this machine and our Regular Single Spindle Lathe still maintain the leading position as adaptable broad range machines,** and these machines possess this desirable characteristic not by giving up their stability or convenience of control, but solely by well considered schemes of design, such as can only be brought forth by specialists.

For instance, let us look at the convenience of setting up the tools for turning a new piece of work on the Double Spindle. We will imagine we have a piece of chuck work about 8 inches in diameter, and, say about 4 inches wide, like a pulley, gear blank, or any similar piece which would require boring an inside hole, turning the outside diameter, facing the flange and hub, and perhaps turning the outside of the hub and inside of the flange and facing the web.

What is the most natural way to group these tools? What form of holding turret gives these tools the most stable support to resist the cutting stress? It seems to us that the most natural way to place these tools near the work previous to clamping them is to lay them down at the edge of a table with their cutting point projecting beyond that edge, just far enough to reach into or over the work, and that the best support for these tools would be such a table mounted solidly on a slide that will bring it up closely to the work so that there is no unnecessary overhang.

With such a thought in mind, we have given the Double Spindle Turret Lathe a square topped flat turret. The edges of its four sides may be presented one after the other to the work. Each edge may carry two sets of tools, the front set for the front spindle and the back set for the back spindle. These edges carry the tools which must have the most rigid and accurate support. (The four corners may be used for carrying drills, reamers, dies, taps or boring tools when working on one spindle at a time.)

Has there ever been presented a more ideal tool support for a Turret Lathe, both for meeting the most natural and convenient way of setting the tools for a new piece of work, and for the firmest control of these tools under working stress?

The means for clamping these tools to the top of the turret are the simplest, and, of course, the tools are likewise the simplest. Then, after that, the single slide scheme of operating reduces the uncertainty. For there is one handle that moves the turret carriage to and from the chuck, and another handle that moves the work-carrying headstock back and forth to get a change of diameter, and when either or both of these motions are made for one tool, we know that the other tool is similarly affected.

But we must go on with our story and give the second part of our announcement.

[illegible]

[illegible] Lathe.

[illegible] Automatic [illegible] built and sold by the Jones & Lamson [illegible] in comparison with the Flat Turret Lathe.

[illegible] not good practice to duplicate the number [illegible] machine shop and we have won a great part [illegible] chucking work so that the whole piece [illegible] in many cases: in fact, in most [illegible] slightly remodeled to meet our conditions we [illegible] Flat Turret Lathe to bore, turn, face, and in fact, perform [illegible] on a piece of work without ever taking it [illegible] blank, for example, we have turned the [illegible] and bored the hole [illegible] the gear blank by chuck [illegible] edge of the rim between the [illegible]

[illegible] single setting [illegible] with each [illegible] machine [illegible]

JONES & LAMSON MACHINE COMPANY

SPRINGFIELD, VERMONT, U. S. A.
77 Queen Victoria St., London, England

COST REDUCING MACHINES FOR LATHE WORK

THE FAY AUTOMATIC LATHE

But—there are pieces of work that must be turned on center point supports. That is, there are pieces of work that can best be supported on regular engine lathe center points. Some of these have no hole through them. In fact, some seem to combine the characteristics of both bar and chuck work and are so formed that there seems only one way to support them and that is on center points such as have been used in the good old engine lathe from the first days of its existence.

And it is to provide for this work that we have taken over the Fay Automatic Lathe. **It is offered for work that must be turned on centers as an auxiliary for the Flat Turret Lathe.**

The good feature about the center point support is that it is the means by which a piece may be taken out and a new piece put into a lathe in the shortest possible time. In other words, it is the quickest process of re-gripping a piece of chucking work. There are other quick ways, but they are lacking in accuracy. There is no "one way" for all pieces of work. There is, however, a one and only way that some pieces should be held, and it is for such pieces that should be held on centers that we are offering this machine.

The Fay Lathe is distinctly a center piece support automatic engine lathe for a certain range of work. It is in a class by itself, and is one of the simplest automatic machines for lathe work.

Although the stability of tool control is superior to many machines for automatic operation, it is not claimed that it approaches the ideal in this respect of the Flat Turret Lathe, but it is equally convenient for quick adjustment for any new piece of work, and it uses the very simplest of cutting tools. The success of this machine is attested by the batteries of them that have been installed by people who have had a chance to know of its merits.

It will be our purpose to furnish full information of this machine so that the work coming within its range may be done where it will be turned out at lowest cost and best advantage, for this is an important link in the lathe equipment of almost every manufacturing machine maker.

Remember, then, that the Jones & Lamson Machine Company of Springfield, Vermont, and London, England, are now building and selling the Double and Single Spindle Hartness Flat Turret Lathe, and The Fay Automatic Lathe for center point support work.

That the Hartness Flat Turret Lathes, Regular and the Double Spindle, are for chuck work as well as for bar work. That they cover chuck work up to 17-inch diameter, are built to give the best independent control of Work and Tools; the Highest Efficiency as profit producers from the investor's standpoint; the machines which give the greatest output when it is wanted, and which will produce almost any conceivable piece of work without special equipment.

The Regular Lathe is our standard machine for meeting the conditions found in machine building plants, such as automobile work, etc.

The Double Spindle meets the demand for the greatest output at expense of a little delay in "setting up" the machine for a new piece, (this delay being negligible on work which requires no change in tooling for periods of several days or more), and

The Fay Automatic Lathe is for work that must be supported on centers.

WINDSOR MACHINE COMPANY

WINDSOR, VERMONT, U. S. A.

FOREIGN OFFICE: 68 Ave. de la Grande Armeé, Paris, France

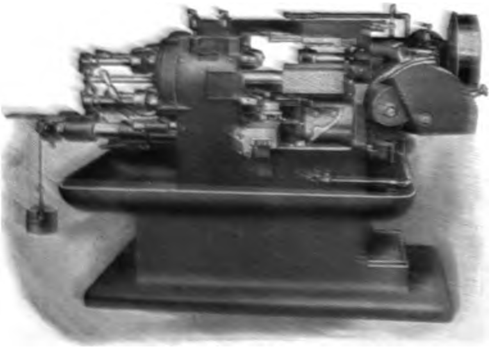
GRIDLEY AUTOMATICS

Increased output can be secured per day, week or month from GRIDLEY AUTOMATICS, because the rigidity of the tools and general design of the machine permit heavier cuts and coarser feeds to be obtained while the type of cutting tool used has a longer life.

Complex work that cannot be made on other automatics can be easily done on Gridleys, for there is room on the tool slide to attach accessories to tools that cannot be used on other machines.

GRIDLEY MULTIPLE SPINDLE AUTOMATICS

have four spindles, a single belt constant speed drive and a quick-change-gear feed box. They are made in three sizes with a maximum capacity for bars of ¾", 1¼" and 2¼" respectively, the ¾" machine finishing work up to and including 4½" in length, the 1¼" up to and including 5½" and the 2¼" up to and including 7".



Gridley Multiple Spindle Automatic

One finished piece or more results each time the tool slide moves forward.

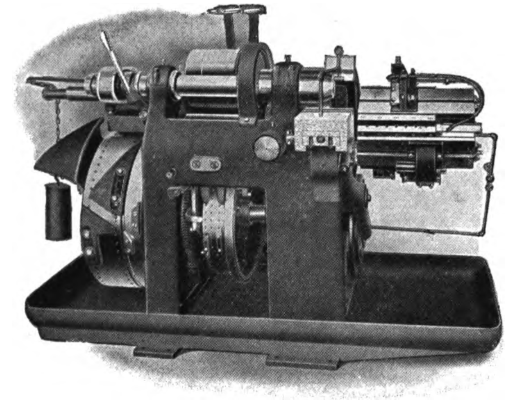
The tool slide being mounted on the stem of the Spindle Carrier insures perfect alignment of all tools with the spindles.

WINDSOR MACHINE COMPANY

GRIDLEY AUTOMATIC TURRET LATHE
(Single Spindle)

These machines are built in three sizes, viz., 2¼", 3¼" and 4¼", with a capacity for handling bars not larger in diameter than their respective sizes imply and turning up to 12" in length.

The tools used on the Gridley Automatic Turret Lathe are different from those used on all other automatics, better results being obtained at a small cost for maintenance. As they are supported close to the cutting edge and held without overhang, rapid and accurate work will be produced at all times.

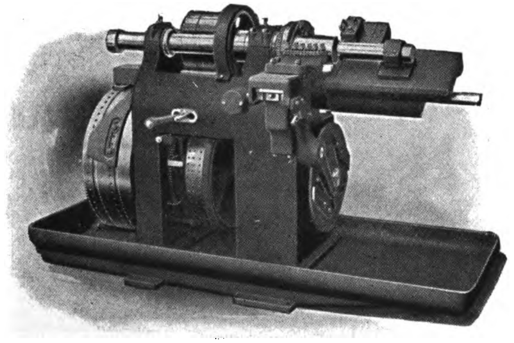


Gridley Automatic Turret Lathe (Single Spindle

GRIDLEY PISTON AND RING MACHINE

This is a semi-automatic, especially designed for making pistons and eccentric piston rings used in gas engines.

The largest ring this machine will handle is 6 inches in diameter. Smaller rings, down to those used in motorcycle engines, can be made as the proper spindle speed can be secured.



Gridley Piston and Ring Machine

Pistons are made to advantage on these machines.

The Piston and Ring Machine is built on the same general lines as the Gridley Automatic Turret Lathe and has the same features of work and feed control.

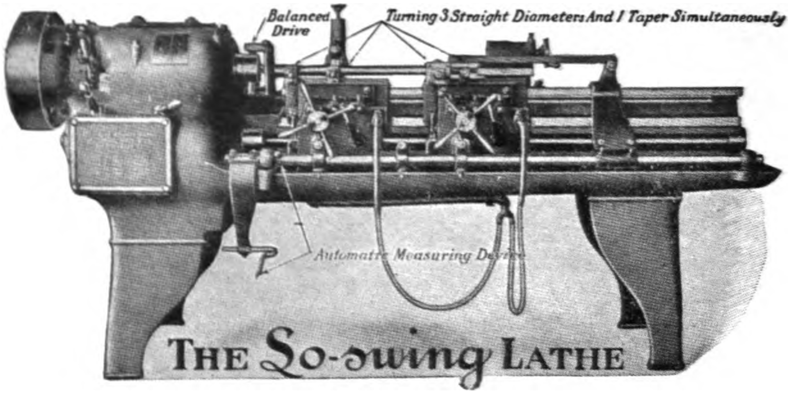
FITCHBURG MACHINE WORKS

FITCHBURG, MASS.

MANUFACTURERS OF THE "LO-SWING" LATHE.

MULTIPLE TOOL TURNING

The "Lo-swing" Lathe specializes on turning work up to 3½" in diameter; and 90% of all shafts having SEVERAL SHOULDERS and ONE or MORE TAPERS are within this limit. It is in fact a variety machine, on all turning—STRAIGHT, TAPER or irregular shapes in almost any combination can be turned SIMULTANEOUSLY. Being a Single Purpose Machine the value of the "Lo-swing" Lathe lies in its PRODUCTION ability, and it stands alone in its design to turn taper and parallel cuts on a shaft at the same time and with from 2 to 6 tools cutting simultaneously.


Balanced Drive
Turning 3 Straight Diameters And 1 Taper Simultaneously
Automatic Measuring Device
THE Lo-swing LATHE

The "Lo-swing" Lathe handles multiple turning in the modern way—turns several diameters at once, turns tapers and irregular sections, necks in channels on shafts of all kinds—in fact, any piece which can be held between centers (up to 3½ inches diameter and 9 feet long) is a job for the "Lo-swing" Lathe, and the more diameters there are to turn the more efficient and economical the operation.

Send us blue-prints of your work and we will submit a "Lo-swing" set-up and time guarantee based on the drawings.

Distinctive Features

Automatic Measuring Device.

Automatic Taper Attachment.

Continuous flow of cutting compound on as many tools as are in service.

Fixed and Follow Rests for long or short work.

Two Carriages. Balance Drive.

All Geared Head and Geared Feed.

Specifications

The "Lo-swing" Lathe is made in three (3) lengths of bed as follows: 60", 84" and 108" between centers.

Swing over ways 4⅞".

Swing over carriage (to turn a rough bar) 3½".

Special Tool Blocks furnished to turn 4½".

THREAD CHASING ATTACHMENT

As a large percentage of shaft work has a thread on one or both ends or several threads spaced along its length, of different diameters, the "Lo-swing" Threading Attachment has been designed to enable all lathe work to be finished on the "Lo-swing" Lathe.

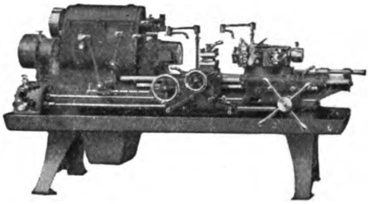
The equipment is designed in two main parts, the threading part, or chaser, which is mounted, and may be located at any point on either of the two "Lo-swing" carriages, and the driving part, or driver, which is fastened on the headstock end of either carriage. The Chaser occupies a space of 5⅛" on carriage and will cut a thread 1¼" long and from ⅝" to 3½" diameter either right or left hand.

THE WARNER & SWASEY COMPANY

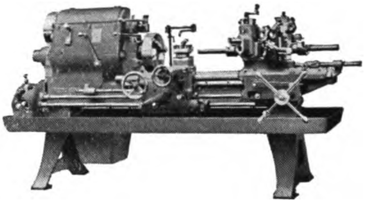
Works and Main Office: CLEVELAND, OHIO

Branch Offices: New York, Buffalo, Boston, Detroit and Chicago

TURRET LATHES TURRET SCREW MACHINES
BRASS-WORKING MACHINE TOOLS



No. 2A—Tools for Bar Work

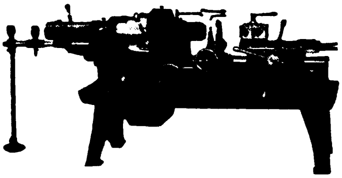


No. 2A—Tools for Chucking Work

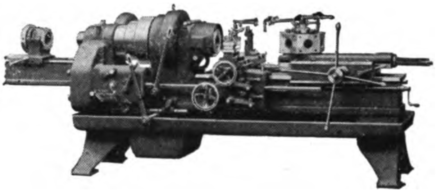
UNIVERSAL HOLLOW-HEXAGON TURRET LATHES

For the rapid, accurate and economical production of lathe work; from bar stock, forgings and castings. Complete tool equipments for bar and chucking work.

Two sizes: Automatic Chuck capacity, 2¼ and 3¼"; length turned, 26 and 36"; chuck swings, 12 and 15".



No. 6—Bar Capacity 2¼"; Swing, 18"



No. 8—Bar Capacity 3⅝"; Swing, 20"

TURRET SCREW MACHINES

Five sizes—⅝ to 3⅝ automatic clutch capacity; 10 to 20" swing.

With or without automatic chuck; bar feed; automatic feed for turret; automatic feed for cut-off, etc.—every modern facility for rapid production.

TURRET LATHES AND BRASS-WORKING MACHINE TOOLS

Turret Lathes—12 to 24" swing; Plain, Set-over or Universal turret; with or without Geared-friction Head, Automatic Chuck; Cut-off; Forming attachment; Chasing attachment, etc.

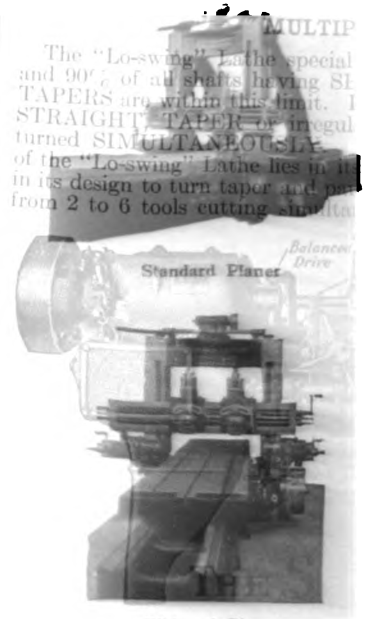
Automatic Boring and Tapping Machines; Valve Milling Machines; Key Lathes; Cock Grinders, etc.—for the manufacture of valves, cocks, fittings and similar work.

Equipments planned and estimates of outputs furnished upon request.

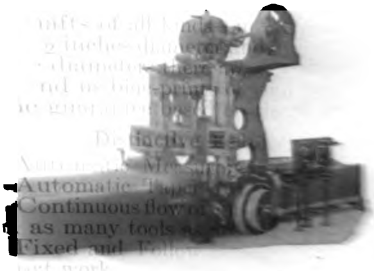
THE CINCINNATI PLANER CO.

CINCINNATI, OHIO

METAL PLANERS



Widened Planer



Variable Speed Planer

Reversible Motor Driven Planer

CINCINNATI STANDARD PLANERS

Cincinnati Standard Planers are designed for strength, rigidity, durability, convenience in operation and adaptability for all classes of work required of a planer.

THE BEDS are of a heavy deep box section of great [illegible] through the body, and are especially strengthened where the gearing and uprights are [illegible]. The length has been increased, being now [illegible] longer than the table.

THE TABLES are of unusual thickness and are [illegible] at short intervals with heavy ribs, thus preventing any possibility of springing under any circumstances.

CROSS RAILS are of great depth, and have an extra deep box brace on the back to give additional stiffness and are accurately scraped to straight edges and surface plates.

THE HEADS are distinctive, the ends of tool blocks and slides being made round to avoid projecting corners on angular work. They are carefully [illegible] to the rail, and are graduated for swivelling [illegible] degrees. They have automatic feeds [illegible] all directions, and can be operated from either side of the machine. The saddles being right and left, the heads can be run very close together.

MICROMETER ADJUSTMENT is furnished on all down feed screws. This consists of a collar graduated into thousandths, and will be found a great convenience in obtaining certain depths of cut quickly and accurately.

THE GEARING AND RACK are of extra wide face and are accurately cut from the solid by a system of [illegible] cutters for each gear. This gives a smooth running machine capable of producing the most accurate work, and insuring great strength and long wear. All the large gears and racks are made from [illegible] castings, and the pinions from steel forgings. All gearing is thoroughly covered for protection from chips and dirt.

CINCINNATI WIDENED PLANERS

[illegible] variety of planing which does not [illegible] machine, and manufacturers are [illegible] the advantage of widened planers. [illegible] to buy a 48″ x 48″ Standard [illegible] because your work is 48″ wide. In [illegible] planer widened to 48″ will do the [illegible] easier to handle and capable of [illegible]. We build these planers to suit your [illegible] patterns for the various sizes given [illegible]

[illegible] x 30″, 42″ x 36″, 48″ x 36″,
[illegible], 72″ x 56″, 96″ x 72″.

CINCINNATI VARIABLE SPEED PLANERS

The [illegible] possible gain in planing comes from [illegible] cutting speeds. A correct [illegible] and conditions, instantly [illegible] economy, in planing. A [illegible] speed of 20 ft. cut and 80 ft. [illegible] cutting ft. per hour, at 40 ft. cut [illegible] 1500 cutting ft. per hour, [illegible]. Our variable speed [illegible] ten cutting speeds and ten [illegible]

CINCINNATI MOTOR DRIVEN PLANERS

[illegible] planers may be arranged for motor drive [illegible] either direct current or alternating [illegible]

THE DETRICK & HARVEY MACHINE CO.

BALTIMORE, MD.

MANUFACTURERS OF THE OPEN SIDE PLANERS; HORIZONTAL BORING, DRILLING AND MILLING MACHINES; SPECIAL MACHINERY.

THE OPEN SIDE PLANER

This term, used by this Company and its predecessors, Detrick & Harvey, for the past 25 years, actually describes the novel and patented construction in contradistinction from metal planers of the ordinary two-post type. These planers are offered as equal to the ordinary type in the performance of the regular line of work, and in capacity and adaptability as excelling any other metal planing tool.

The Open Side Planer takes work under the beam slightly larger than the rated vertical dimension, and squares down the outside of work to the rated width. It actually planes, by angling the beam head. several inches wider on a straight surface.

Sizes and Capacity

Size	Will Plane Wide, Ins.	Will Plane High, Ins.	Length, Feet
30 Inch	40	31	6, 8, 10, 12, 14
36 Inch	50	37	8, 10, 12, 14, 16
42 Inch	58	43	10, 12, 14, 16, 18
48 Inch	62	49	12, 14, 16, 18, 20
60 Inch	75	61	14, 16, 18, 20, 22
72 Inch	91	73	16, 18, 20, 22, 24

THE CONVERTIBLE OPEN SIDE PLANER

is designed to cover a wide range of planing work and is the equal of a double housing planer of the same rated capacity, embodying the use of four tools. Through the removal of the outer housing or post, the machine is converted into an Open Side Planer, and the wide range and great adaptability peculiar thereto is obtained. The Convertible Open Side Machines are built in sizes 42 inches to 96 inches square, by any length.

THE OPEN SIDE EXTENSION PLANER

This type differs from the standard Open Side Planer in that it has an outside post and long beam. This outside post is adjustable in an extension bed to and from the Planer platen. It will be especially noted that both side heads can be used simultaneously in a wide range of work, varying in size from the width of the table to the full rated width of the Planer, while the long beam gives a corresponding range of travel to the horizontal heads.

These machines are made in the following sizes:

To plane 84 inches by 60 inches high by 12, 14, 16, 18 or 20 feet if desired.

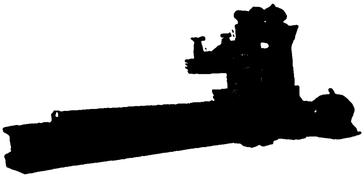
To plane 96 inches wide by 72 inches high by 14, 16, 18, 20 or 22 feet, or longer, if desired.

To plane 120 inches wide by 96 inches high by 16, 18, 20, 22 or 24 feet, or longer, if desired.

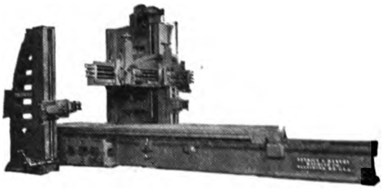
To plane 120 inches wide by 120 inches high by 24 feet, or longer, if desired.

HORIZONTAL DRILLING, BORING AND MILLING MACHINES

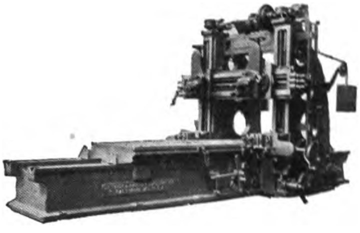
These machines are commonly known as Floor Boring Machines and consist principally of a Column mounted on a Runway, a Spindle-Saddle mounted on the Column and a Work Bed. Can be equipped with Outer Support, Universal Table, Plain Table, Scales and Pump.



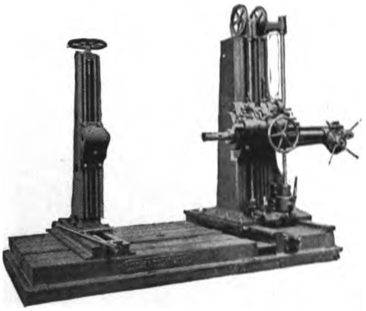
Motor Driven Open Side Planer



Convertible Open Side Planer, Showing Outer Housing Removed Converting the Machine into an Open Side Planer



Standard Double Housing Planer



Horizontal Drilling, Boring and Milling Machine

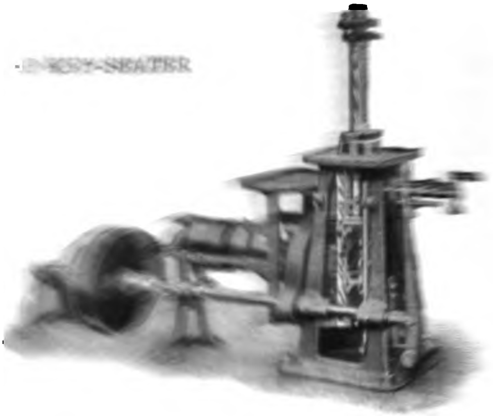
MITTS & MERR[illegible]

[illegible] MICHIG[illegible]

[illegible] GIANT KEY-SEATER. [illegible]

[illegible]

[illegible] KEY-SEATER



[illegible] Key-Seater and Countershaft.

[illegible] perfectly true. Key-ways [illegible] faced true or left [illegible] and accurately set [illegible]

[illegible] possible to save the expense [illegible] saving in money represented [illegible]

[illegible] deep can be cut in two minutes. [illegible] from machine.

[illegible] Key seats in holes from ½ inch [illegible] possible for the largest machine [illegible] In key seating small work such as [illegible] or more pieces can be cut at one time. [illegible]

[illegible] work, such as square holes, half-round [illegible] special shapes such as [illegible]

[illegible] can be fastened [illegible]

[illegible] OTHER DATA

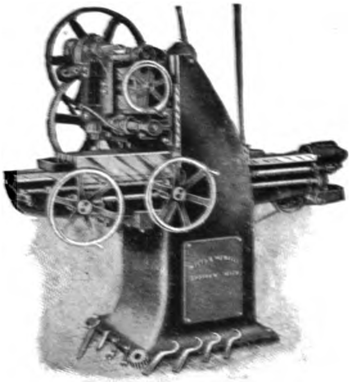
[illegible]	Approx. [illegible] Weight	Floor Space
[illegible]	[illegible]	2 x 3 ft.
[illegible]	[illegible]	5 x 2 ft.
[illegible]	[illegible]	5½ x 2 ft.
[illegible]	[illegible]	5½ x 2 ft.
[illegible]	[illegible]	6 x 2 ft.
[illegible]	[illegible]	6½ x 3 ft.
[illegible]	[illegible]	6½ x 3 ft.
[illegible]	[illegible]	6½ x 3 ft.

MITTS & MERRILL

SAGINAW, MICH.

KEY-SEAT MILLING MACHINE

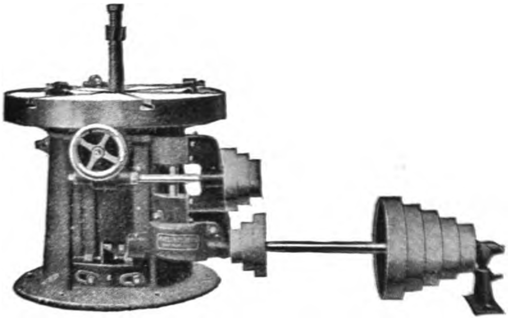
Our No. 3 Key-Seat Milling Machine is equipped with a vertical arbor for routing out the ends of key-seats. The machine is strongly geared and stiffly built for key-seating shafts up to 10" in diameter, and for ordinary plain milling up to capacity of the machine. The hand wheels for the different feeds and movements of the machine are conveniently arranged and the weight of the crossrail and gearing is counterbalanced. The platen has basins on each end to catch the lubricant for which the rail serves as a reservoir. The vertical and cross feed have micrometers for fine adjustment. With the machine is furnished wrenches and an adjustable floor stand for shafting. Two smaller sizes are made as listed below. The No. 1 machine is only suitable for milling key-seats in shafting. Nos. 2 and 3 will do for plain milling also.



No. 3 Key-Seat Milling Machine
For 1 inch to 10 inch shafts.

Machine	Capacity	Table	Traverse	Floor Space Req.	Weight
No. 1	¾ in. to 3 in. dia. shaft	12 long	14	34 x 22	800 lbs.
No. 2	1 in. to 6 in. dia. shaft	26 x 12	34	36" x 31 or 40	2800 lbs.
No. 3	1 in. to 10 in. dia. shaft	44 x 12½	43	74 x 36	4100 lbs.

BORING MILL



For Straight or Taper Holes up to 8 in. Diameter

We illustrate a Boring Mill which we manufacture and have used in our own shop for several years. It is designed for boring a class of duplicate or heavy work difficult to chuck in a lathe, and for the occasional job of large diameter. Driving shaft and pulley can be extended any distance required to swing the work on revolving table. Cutter bar is clamped in a saddle sliding on a vertical rail which is pivoted at the top and can be swung from the perpendicular to bore holes up to 2 inch taper per foot or more if required.

Capacity: will bore holes up to 8 inches diameter and 18 inches long.

Table: 35 inches diameter, 5 inches deep; has 6 T slots for $\frac{7}{8}$ inch bolts. Height of table above floor, 33 inches. Bearing for table is a 7½° x 45° V bearing 3 inches wide, 18 inches diameter.

Vertical rail, 2 feet 9 inches long, 10 inches wide.

Saddle has bearing 14 inches long and a travel of 18 inches. Saddle holds boring bars up to $2\frac{15}{16}$ inches diameter.

Floor space, 3 feet 6 inches by 6 feet 6 inches. Weight 2300 lbs.

T. C. DILL MACHINE COMPANY, INC.

PHILADELPHIA, PA., U. S. A.

BUILDERS OF SLOTTERS

THE "DILL SLOTTER"

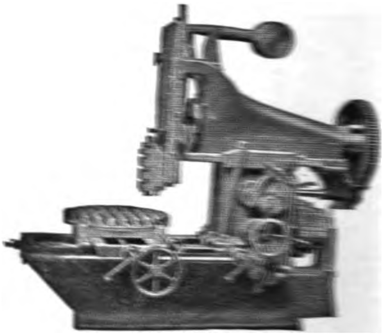
In the design of the "Dill Slotter," to meet the demands of to-day, it was plain that a departure was necessary and that procedure must be in at least two directions. First: that the machine must be able to produce a greater amount of work and that work must be more accurate. Second: that it must have a much greater range and not be confined only to the ordinary slotter work, but also reach out into other fields of usefulness; and, besides all this, it must be, if possible, more durable. The following features, which for the most part are exclusive, show how this Slotter meets the above requirements.

The GENERAL CONSTRUCTION of the "Dill Slotter" throughout is such as to insure efficiency and durability. It is constructed of the best material for the purpose; the gears are all cut from solid metal and mostly of forged steel; flat bearing surfaces are all hand-scraped to surface plates and are of ample dimensions. Gears, shafts, etc., are readily accessible for inspection. The convenience of operation is of special merit; while it is operative from one point principally, hand feeds are provided on all sides.

Attributes

- A Traveling Head—Greatly increases the range of the machine.
- A Quick Traverse Gear—A great time and labor saver.
- New Quick Return—Permits high and uniform cutting speeds.
- New Intermittent Feed—For feeding heavy work at high speeds.
- An Automatic Knock-Off—A safety device for the feed mechanism.
- A Stroke Indicator—Quite indispensable; nothing like it.
- A Hand Wheel Controller—A good thing, and in the right place.
- A Tool Post in the Relief Apron—Very handy in changing tools.
- Six Changes of Speed—About four is the usual number.
- Belt and Motor Driven—Designed for both; not a make-shift.
- Powerfully Geared—About double the usual ratio.

15 Inch Slotter. Belt or Motor Driven



Arranged for Belt Drive

PRINCIPAL DIMENSIONS

Size of machine, ins.	10	10–12	15	15–18	20	20–24
Maximum stroke, ins.	10½	12½	15½	18½	[illegible]	25
Longitudinal movement of table, in.	28	28	36	36	[illegible]	[illegible]
Transverse movement of table, in.	26	26	30	30	40	40
Diameter of table, in.	24	24	34	34	[illegible]	[illegible]
Movement of head, in.	15	15	[illegible]	20	30	30
From table to head, in.	12	12	[illegible]	19½	[illegible]	[illegible]
[illegible]	16	16	23	23	22	22
Will cut to the centre of circle of	54 in.	54 in.	72 in.	72 in.	[illegible] in.	92 in.
Will cut to outside of circle of	54 in.	54 in.	90 in.	90 in.	116 in.	116 in.
Strokes of ram per minute [illegible]	[illegible]	[illegible]	[illegible]	7–43	[illegible]	[illegible]
Feed of table per stroke, in.	[illegible] to 0.154	[illegible] to 0.154	0.010 to 0.187	0.010 to 0.187	[illegible] to 0.138	0.0069 to 0.138
[illegible]	0.0187 to 0.296	0.0187 to 0.296	[illegible] to 0.196	0.012 to 0.196	0.0055 to [illegible]	0.0055 to 0.11
[illegible]	[illegible] to 0.078	[illegible] to 0.078	0.005 to 0.093	0.005 to 0.093	0.00345 to 0.069	0.00345 to [illegible]
[illegible] pulley shaft	12 to 1	12 to 1	18 to 1	18 to 1	[illegible] to 1	[illegible] to 1
[illegible] in.	14 × 3½	14 × 3½	20 × 4	20 × 4	25 × 5	25 × 5
[illegible]	200	180	200	180	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	5	5	10	10
[illegible]	1,200	[illegible]	[illegible]	1,000	[illegible]	[illegible]
[illegible]	400 to 1,200	400 to 1,200	400 to 1,200	400 to 1,200	400 to 1,200	400 to [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	10,500	[illegible]	[illegible]

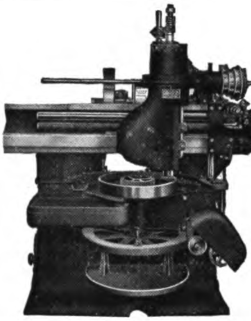
THE FELLOWS GEAR SHAPER CO.

SPRINGFIELD, VERMONT, U. S. A.

MANUFACTURERS OF THE FELLOWS GEAR SHAPER AND GEAR SHAPER CUTTERS

THE FELLOWS GEAR SHAPER

The Gear Shaper is a gear generator, developing the gear tooth by a planing process. The cutter used is an original gear which is ground after it is hardened.



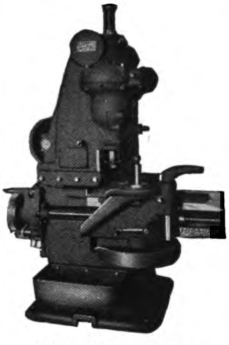
No. 6 Gear Shaper
Planing Internal Gear

Action of the Gear Shaper

After fastening the blank to the work arbor, the machine is started and the cutter moves up and down in true shaper style. The cutter is then fed toward the blank and cuts its way to the proper depth. The feed of the cutter is produced by a slow rotation of the cutter and the blank in unison. The combined result of rotary and reciprocatory motions is that the cutter teeth generate conjugate teeth in the blanks which mesh correctly with the cutter teeth and with each other. Any two gears of the same pitch cut with this cutter mesh correctly together.

Distinctive Features

1. The Gear Shaper cuts a theoretically correct gear tooth. Because the tooth curve of the cutter is ground after it is hardened, the cutter and work cut by it approach nearer to absolute perfection than anything else produced in this line.



No. 3 Gear Shaper
Front View

2. Only one cutter for each pitch is necessary. The investment in cutters is reduced very largely.
3. It will cut more gears than any other machine.
4. An error in spacing is an impossibility.
5. No depth gauge is required; the machine attends to that automatically.
6. The work is held by the "face plate system."
7. It cannot produce an incorrect form of tooth by setting the cutter "off the center."
8. The cutter travels practically the face of the blank only, whereas the milling cutter must travel from 10 to 40 per cent more.
9. A variation in diameter of blank or depth of cut does not produce noisily running gears.
10. It will plane internal gears.
11. Center distances can be exactly duplicated.
12. It will plane into a narrow recess.
13. Gear teeth cut upon this machine give the full theoretical bearing.

Capacity

The No. 3 Gear Shaper cuts external spur gears of 24 inches diameter, 4 inches face, 6 diametrical pitch in cast iron, 7 pitch in steel. The No. 6 machine cuts external spur gears of 35 inches diameter, 5 inches face, 4 diametrical pitch, and internal spur gears of 28 inches pitch diameter, 3 inches face, 4 diametrical pitch.

THE GEAR SHAPER CUTTER

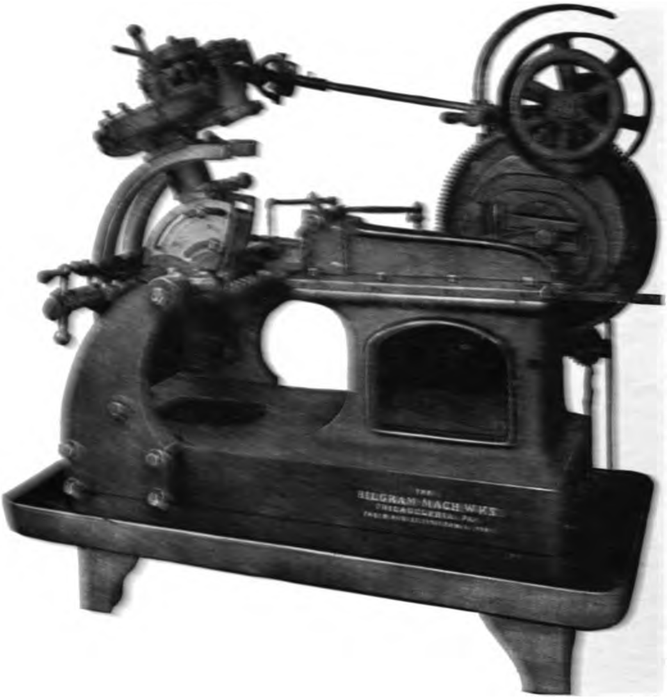
The Fellows Gear Shaper Cutter has teeth in which the involute curve is generated by rolling the cutter tooth past an emery wheel in true rack and pinion movement, the cutter representing the pinion and the emery wheel one side of a rack tooth. This makes every cutter an original gear with generated teeth, and as this grinding is done *after the cutter is hardened*, it insures accurate work at all times.

The Gear Shaper Cutter
and a Partially Cut Blank

THE BILGRAM MACHINE WORKS

1217 Spring Garden St. PHILADELPHIA, PA.

MAKERS OF SPECIAL MACHINERY. BEVEL GEARS CUT THEORETICALLY CORRECT. SPECIAL FACILITIES FOR CUTTING SPUR, WORM, SPIRAL AND INTERNAL GEAR WHEELS.



THE BILGRAM BEVEL GEAR GENERATOR

SIX INCH TYPE

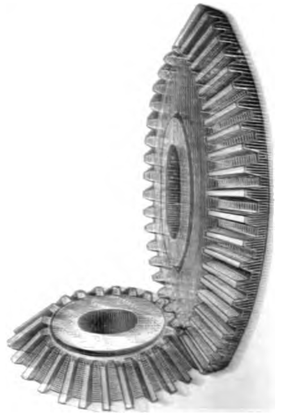
Planes bevel wheels up to 6 in. diameter, 1 in. pitch, 2½ face, from miter wheels to bevel wheels of proportion one to six.

Floor Space	3 ft. 10 in. x 2 ft. 3 in.
Net weight of machine	2000 lbs.
Net weight of countershaft, cone sectors, etc.	400 lbs.
Gross weight	2800 lbs.

SIXTEEN INCH TYPE

Planes bevel wheels up to 16 in. diameter, 2 in. pitch, 6 in. face from miter wheels to bevel wheels of proportion one to four.

Floor space	6 ft. 1 in. x 2 ft. 8 in.
Net weight of machine	4800 lbs.
Net weight of machine, countershaft, cone sectors, etc.	800 lbs.
Gross weight	6100 lbs.



MODERN TOOL COMPANY

ERIE, PA., U. S. A.

SELF OPENING DIE HEADS, ADJUSTABLE SOLID DIES, TAP AND DIE HOLDERS, CHASER GRINDERS, FRICTION AND POSITIVE DRIVE MAGIC CHUCKS, TAPPING ATTACHMENTS, AND MODERN GRINDING MACHINES; MAKERS OF SPECIAL TOOLS.

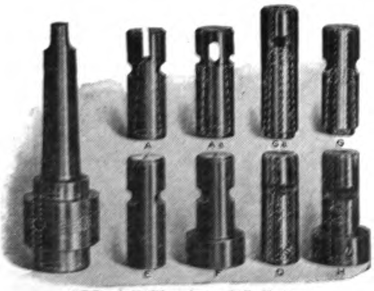
“MODERN” SELF OPENING DIES

“Modern” Self Opening Die

The advantages of the “Modern” Die are many. The Die opens automatically when the thread is cut. No reversing of the machine. The return is 2½ to 1. No danger of injuring either the thread or Die. 50% to 80% in time and wear to belts and countershaft is saved. The “Modern” is the one Die having a steel cam to hold Chasers in place directly over point of duty, making it impossible for Chasers to bell at the mouth and preventing irregular or taper thread. When a large amount of stock is to be removed or precision required, a roughing and finishing attachment will be furnished.

“Modern” Chasers are cut all on a hob and are made either of carbon or high speed steel.

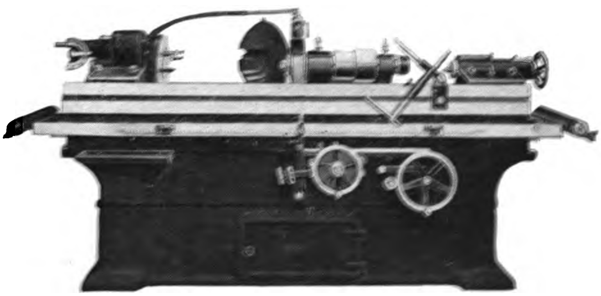
“MAGIC” CHUCK EQUIPMENT



“Magic” Chuck and Collets

For the rapid changing of tools in drill press, lathe, screw machine, etc., without stopping the machine, practically converting a single spindle machine into a multiple spindle one, with as many tools as you may have operations. Try it and save labor cost.

“MODERN” GRINDING MACHINES



“Modern” Grinding Machine

Much unnecessary weight is eliminated and perfect rigidity and freedom from vibration secured by the scientific distribution of material in “Modern” Grinding Machines. Generous bearings for all moving parts reduce the possibility of wearing and prevent absolutely all chatter. Centralization of working parts secures perfect transmission of power to the working point. Accessibility of the working parts for care and attention by the operator makes minimum loss of use, cost of up-keep and depreciation. Improved operative features insure large production and precision work.

ALL “MODERN” TOOLS GUARANTEED TO BE SATISFACTORY TO THE USER

Complete information concerning products will be mailed interested parties upon request.

LANDIS TOOL COMPANY

WAYNESBORO, PA.

PRECISION CYLINDRICAL GRINDING MACHINES

Our regular line consists of the following types and sizes:

UNIVERSAL MACHINES: No. 1, 10"x20"; No. 1½, 10"x30"; No. 2, 12"x32"; No. 3, 12"x42"; No. 4, 12"x66". Nos. 2, 3 and 4 are also built with 16" swing, and are used for finishing tools and a variety of straight or taper parts, both external and internal, such as are common to the toolroom, machine shop, railroad shops, etc.

Attachments, such as magnetic chuck, gear-cutter attachment, side mill grinding attachment, etc., can be used on these machines to advantage.

PLAIN GRINDING MACHINES: 10"x20", 10"x30", 12"x32", 12"x42", 12"x66", 16"x66", 12"x96", 12"x120", 16"x72", 20"x96", 20"x120", 20"x144", 20"x168". These strictly manufacturing machines are intended for finishing straight and taper spindles, shafts, rolls, milling arbors and other work within their range which can be revolved on dead centers.

PLAIN GRINDING MACHINES WITH GAP are our 16" and 20" swing Plain Machines, built with a gap in the bed to suit the location of the projection on the work. Especially valuable for grinding locomotive piston rods.

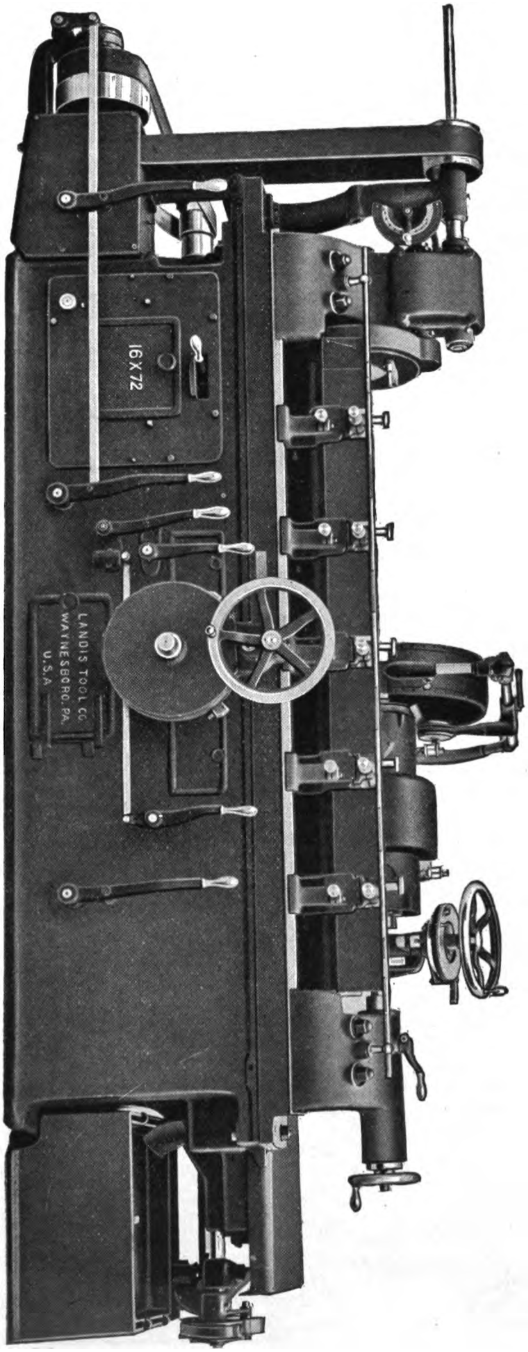
INTERNAL GRINDING MACHINE for straight and taper internal grinding, and the various sizes of these machines will grind holes ¾" diameter, or larger, and up to 12" long.

CRANK GRINDING MACHINE for grinding single or multiple throw crank shafts used in gas and small steam engines.

ROLL GRINDING MACHINES for grinding chilled iron and hardened steel rolls.

CAM GRINDING ATTACHMENTS for grinding cams are for use on our plain and universal grinders and are made for grinding either detachable or integral cams.

Our illustrated and descriptive catalogue and literature gives detailed information. It also describes the features which stand for quick manipulation, accurately finished work, durability of alignments and rapid production—all of which are prominent in the various types of Landis Grinding Machines.



Landis Self-Contained Plain Grinding Machine

THE GEOMETRIC TOOL COMPANY

NEW HAVEN, CONN.

MANUFACTURERS OF SPECIAL MACHINERY AND TOOLS

SPECIAL THREADING TOOLS

In the manufacture of small parts the demand for rapid and economical production, combined with higher standards of accuracy, has caused old methods of threading to be almost entirely discarded. To meet this demand the Geometric Special Threading Tools were placed on the market a number of years ago and have since been developed to a point where they are unequalled for accuracy and economy.

GEOMETRIC SCREW-CUTTING DIE-HEAD

Self-opening and Adjustable

Style "D" Die-Head with Roughing Attachment

In the Geometric Die-head the dies are opened automatically by simply stopping the travel of the turret slide when the desired length of thread is reached. Four or more accurately hardened chasers or dies, of carbon or high-speed steel, carried in a substantial head, are used according to the diameter of the work. All Die-heads are equipped with micrometer scales by means of which a tight or loose fitting thread may be cut, also making it possible to compensate for wear of the dies. The saving thus effected through the greatly increased possible output and elimination of waste material through defective pieces, will soon far exceed in value the difference in the initial cost of a Geometric Die-head as compared with a solid die.

Style "D"—This type is designed for use on the turret of hand and automatic screw machines, in place of solid dies. A roughing and finishing attachment forms part of this style in sizes over and including ¾ inch.

Style "C"—This style embraces special types for threading automobile parts, plumbers' supplies, bicycle parts, brass and iron fittings and for cutting standard iron pipe threads.

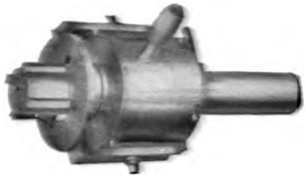
Style "DD" is especially designed for use in the turret of the Cleveland or similar automatic screw machines. The Die-head is supported by a spring mechanism between the head and the shank, which permits the chasers to compensate for any inaccuracy of adjustment of the turret.

Solid Adjustable

The Geometric Solid Adjustable Die-head is a special form of Die-head designed for use on automatic screw machines where the direction of rotation of the piece is reversed on the completion of the thread. The chasers are of the standard Geometric form and are interchangeable with those employed in the Styles "D" and "DD" Die-heads.

GEOMETRIC ADJUSTABLE COLLAPSING TAPS.

Where work of one inch or greater diameter has to be tapped, the advantages of Geometric Collapsible Taps are so numerous as to place them in a class entirely by themselves. They automatically collapse when the required depth has been reached, and can be instantly withdrawn without running back over the threads. Can be used on a live spindle, such as a drill press, as well as on a screw machine or turret lathe.



Class "N-L" Tap Equipped with Chasers for Bottoming

Class "N-L" Collapsing Tap is furnished to cut pipe threads from ¾ to 12 inches in diameter inclusive. It may also be furnished for tapping other classes of work up to a maximum diameter of 12¾ inches, and either in the plug or bottoming type.

Class "P" Taps are designed solely for tapping fine pitch threads of short depth. They can be furnished for cutting diameters from ¾ inch up to 10 inches inclusive.

THE GEOMETRIC TOOL COMPANY

SPECIFICATIONS AND PRICES

Style "D" Self-Opening and Adjustable Screw-Cutting Die-Heads

Size, Ins.	Diam. of Head, Ins.	Length of Head, Ins.	Diam. of Shank, Ins. *	Length of Shank, Ins.	Length Over All, Inches	Capacity, Inches	Coarsest Pitch of Thread	Greatest Length will Cut, Ins.	Price, including One Set of Dies for One Standard Pitch Thread	Extra Dies per set, Carbon Steel	Extra Dies per set, H. S. Steel	Blank Dies per set, Carbon Steel	Code Word
5/16	1¾	1⅜	⅝ or ¾	1¾	3⅛	3/32 to 5/16	18	Any l'g'th when standard shank is used	$25.00	$1.50	$2.25	$0.75	Pitch
9/16	2 7/16	2 1/16	⅞ or 1	2½	4 9/16	⅛ to 9/16	12		30.00	1.75	2.63	.90	Past
¾	2 15/16	2 13/16	1¼ or 1½	3	5 13/16	¼ to ¾	10		40.00	2.00	3.00	1.00	Push
1	3 9/16	3¼	1½ or 1¾	3½	6¾	⅜ to 1	8		50.00	2.50	3.75	1.25	Pull
1¼	4 15/16	4	1¾ or 2	4¼	8¼	½ to 1¼	7		65.00	3.00	4.50	1.50	Pale
1½	5 5/16	4¾	2¼ or 2¾	4¾	9½	⅝ to 1½	6		80.00	3.50	5.25	1.75	Part
2	6⅜	5¼	3 or 3½	5¼	10½	¾ to 2	4½		95.00	4.00	6.00	2.00	Punt
2½	6⅞	5⅜	3½ or 4	5⅞	11¼	1 to 2½	4		135.00	5.00	7.50	2.50	Pet
3	7½	6⅛	4 or 4⅝	6½	12⅝	1½ to 3	3½		175.00	6.00	9.00	3.00	Pilf
3½	8½	7	4½ or 5½	7	14	2 to 3½	3¼		215.00	7.00	10.50	3.50	Pick
4½	11	8⅛	6 or 7½	10	18⅛	2½ to 4½	2¾		275.00	10.00	15.00	5.00	Pike

Style "DD," Model 1911, Self-Opening and Adjustable Screw-Cutting Die-Heads

Size, Ins.	Diam. of Head, Ins.	Length of Head, Ins.	Diam. of Shank, Ins. *	Length of Shank, Ins.	Length Over All, Inches	Capacity, Inches	Coarsest Pitch of Thread	Greatest Length will Cut, Ins.	Price, including One Set of Dies for One Standard Pitch Thread	Extra Dies per set, Carbon Steel	Extra Dies per set, H. S. Steel	Blank Dies per set, Carbon Steel	Code Word
5/16	1¾	2¼	⅝ to 1¼	5	7¼	1/16 to 5/16	18	2	$30.00	$1.50	$2.25	......	Olam
9/16	2 7/16	2 15/16	⅝ to 1⅞	5	7 15/16	⅛ to 9/16	12	3	35.00	1.75	2.63	......	Oak
¾	2 15/16	3⅜	⅝ to 1⅞	5	8⅜	¼ to ¾	10	3½	45.00	2.00	3.00	......	Otis
1	3 9/16	4 3/16	⅞ to 2½	5	9 3/16	⅜ to 1	8	4	55.00	2.50	3.75	......	Opal
1¼	4 7/16	4 9/16	1 to 3¼	6	10 9/16	½ to 1¼	7	4½	70 00	3.00	4.50	......	Ode

Solid Adjustable Screw-Cutting Die-Heads

Size, Ins.		Capacity, Inches	Coarsest Pitch of Thread	Greatest Length will Cut, Ins.	Price, including One Set of Dies for One Standard Pitch Thread	Extra Dies per set, Carbon Steel	Extra Dies per set, H. S. Steel	Blank Dies per set, Carbon Steel	Code Word
5/16	Fitted with Plain Shank.......	3/32 to 5/16	18	Depending on shank used	$15.00	$1.50	$2.25	$0.75	......
	Fitted with Releasing Holder..				17.50				
	Fitted with Gridley Holder....				20.00				
9/16	Fitted with Plain Shank.......	⅛ to 9/16	12		20 00	1.75	2.63	.90	......
	Fitted with Releasing Holder..				22.50				
	Fitted with Gridley Holder....				25.00				
¾	Fitted with Plain Shank.......	¼ to ¾	10		25.00	2.00	3.00	1.00	......
	Fitted with Releasing Holder..				27.50				......
	Fitted with Gridley Holder....				30.00				
1	Fitted with Plain Shank.......	⅜ to 1	8		35.00	2.50	3.75	1.25	......
	Fitted with Releasing Holder..				37.50				
	Fitted with Gridley Holder....				40.00				

Class "NL" Collapsing and Adjustable Pipe Taps

Size, Ins.	Largest Diameter of Head, Ins.	Length of Head	Diameter of Shank, Ins. *	Length of Shank, Ins.	Morse Taper Shank	Length Over All, Ins.	Capacity, Standard Pipe Sizes, Ins.	Capacity, Straight Thread, Ins.	Greatest Depth, Straight Tapping, Ins.	Coarsest Thr'ds per In.	Price, including One Set of Carbon Steel Chasers	Extra Chasers per Set, Carbon Steel	High Speed Steel	No. of Chasers per Set
¾	2 5/16	4 1/16	⅝ to ⅞	2½	No. 2	6 13/16	¾	15/16 to 1⅛	1⅛	14	$40.00	$3.25	$4.88	4
1	3¼	5⅝	1 to 1⅜	4¾	Nos.3 or 4	10⅜	1	1⅛ to 1⅜	1½	11	45.00	3.25	4.88	4
1¼	3¼	5¾	1 to 1⅜	4¾	Nos.3 or 4	10½	1¼	1⅜ to 1¾	1⅝	11	50.00	3.25	4.88	4
1½	3 13/16	6¼	1⅛ to 1⅝	4¾	No. 4	11	1½	1⅝ to 2⅛	1¾	11	55.00	3.50	5.25	4
2	3 13/16	6⅜	1⅛ to 1⅝	4¾	No. 4	11⅛	2	2⅛ to 2¾	1⅞	11	60.00	3.50	5.25	4
2½	4⅞	7	1½ to 2⅜	4¾	Nos.4 or 5	11¾	2½	2½ to 3¼	2	8	65.00	4.50	6.75	6
3	5¼	7⅛	1⅝ to 2⅜	5	No. 5	12⅛	3	3⅛ to 4	2⅛	8	70.00	5.00	7.50	6
3½	5⅝	7⅛	1⅝ to 2⅜	5	No. 5	12⅛	3½ & 4	3⅝ to 4⅝	2⅛	8	75.00	5.00	7.50	6
4	6½	8 5/16	1⅝ to 3⅛	5	Nos.5 or 6	13 5/16	4 & 4½	4⅛ to 5¼	2½	8	80.00	5.50	8.25	6
4½	7	8 5/16	1⅝ to 3⅛	5	Nos.5 or 6	13 5/16	4½ & 5	4⅝ to 5⅞	2½	8	85.00	5.50	8.25	6
5	7½	9 5/16	1¾ to 3⅞	5½	Nos.5 or 6	14 13/16	5 & 6	5¼ to 6⅝	2¾	8	90.00	6.00	9.00	6
6	8½	9 5/16	1¾ to 3⅞	5½	Nos.5 or 6	14 13/16	6 & 7	6¼ to 7¾	2¾	8	100.00	6.00	9.00	6
7	9½	9 5/16	1¾ to 3⅞	5½	Nos.5 or 6	14 13/16	7 & 8	7¼ to 8⅞	2¾	8	125.00	6.50	9.75	6
8	11¼	9 11/16	2 to 4½	6	No. 6	15 11/16	8 & 9	8¼ to 10	3	8	150.00	8.00	12.00	8
9	12¼	9 11/16	2 to 4½	6	No. 6	15 11/16	9 & 10	9¼ to 11¼	3	8	175.00	8.00	12.00	8
10	13¼	9 11/16	2 to 4½	6	No. 6	15 11/16	10 to 12	10¼ to 12¾	3	8	200.00	10.00	15.00	10

* Shanks of special diameter and length can be furnished where required.

(Continued on next page)

(Continued from preceding pages)

THE GEOMETRIC TOOL COMPANY

GEOMETRIC THREADING MACHINE

Will produce accurate work in quantity and should not be confused with the usual run of bolt-threading machines. The machine is regularly equipped with a standard style "D" Die-head modified to meet the changed requirements of operation and with a range from ¼ to ¾ inches. Can be fitted for cutting standard screw threads up to and including 3-4"—10 pitch. A larger Die-head equips the machine for threading brass tubing and similar work up to 2" diameter, where the thread is not coarser than 22 pitch.

Speeds of machine spindle when countershaft is run at speed of 225 RPM.

Gear Box..	¼"	5/16"	3/8"	7/16"	½"	5/8"	¾"
Speeds...	225	180	150	128	112	100	90

COUNTERSHAFT

Driving Pulley	8½"x2¾"
Tight and Loose	7" x 2¾"
Speed	225 RPM.
Net weight of Machine	394 lbs.
Net weight of Countershaft	92 lbs.
Gross weight	567 lbs.

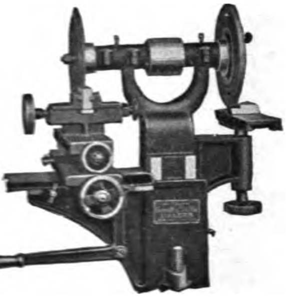
Price quoted after knowing requirements.

It can also be equipped with a Geometric Collapsing Tap or a Reversing Tap Holder for inside threads as well, according to the size of hole to be tapped. The range of tapping that is possible with this machine is from ⅛ inch to 2 inches, and even to 3 inches where the pitch of thread is fine.

GEOMETRIC CHASER OR DIE GRINDER

Continued accuracy is naturally the chief requirement of all screw-cutting operations. With the Geometric Chaser or Die Grinder the difficulties of hand grinding are overcome and all chasers of a set may be ground uniformly to within a close limit of tolerance. It is adapted for grinding *any make* of thread chaser, whether of a stock or special type.

Speed of countershaft	690 RPM
Actual floor space required	25 x 25"
Net weight of machine	230 lbs.
Net weight of countershaft	55 lbs.
Gross weight	375 lbs.



Chasers in Place for Grinding on Throat and Face

GEOMETRIC ADJUSTABLE HOLLOW MILLING TOOL

These tools are specially designed for brass finishing and will be found most effective and economical for reducing duplicate parts to an exact diameter prior to threading. They can also be used for light cutting on cast iron, steel or similar material. They are made from solid bar steel and are extremely simple and durable.

SPECIFICATIONS AND PRICES

Size, Ins.	Diam. of Head, Ins.	Length of Head, Ins.	Diam. of Shank, Ins.	Length of Shank, Ins.	Length Over All, Ins.	Capacity with Complete Set of Cutters, Ins.	No. of Single Sets in a Complete Set	No. of Single Cutters in a Single Set	Price, Including Complete Set of Carbon Steel Cutters	Extra Carbon Steel Cutters, per Single Set	Extra High-Speed Cutters, per Single Set	Code Word
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	26 00	1 25	1.88	Tire
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	32 00	1 50	2.25	Thine
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	34 00	1 50	2.25	Tole
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	35 00	1 50	2.25	Tell
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	40 00	2 25	3.38	Talk
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	45 00	2 25	3.38	Tick
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	50 00	2 25	3.38	Thank

IDEAL TOOL & MANUFACTURING CO.

BEAVER FALLS, PA.

MANUFACTURERS OF SCREW CUTTING DIES

THE IDEAL OPENING DIE

Opens by power of cutting strain: The cutting strain in all opening dies has a tendency to revolve the head holding chasers and not the cam. It is obvious therefore that by allowing the head of our die to revolve, we convert the cutting strain into an opening power instead of depending on springs.

Head revolves instead of cam: The superiority of this construction over dies which depend on the life and variation of a spring for their successful operation, will be apparent to every mechanic. Spring actuated devices are notably unreliable, and apt to be out of order when most needed.

Faulty alignment overcome: We have designed in our die an equalizing driving clutch which compensates for any imperfection in alignment of either the turret or the material being threaded.

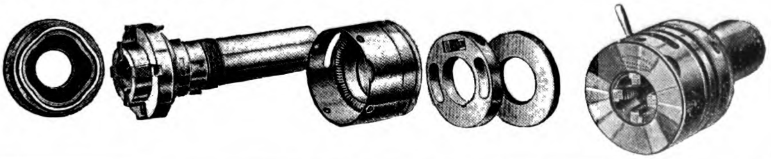
Chasers supported: The support for chasers in the Ideal Die puts an end to the tipping evil. They are supported by a hardened cam directly over and slightly preceding the point of strain. This chaser support together with the equalizing driving clutch, eliminates taper threads and bad work generally.

Four chasers instead of three: The advantage of four chasers over three is obvious. With four chasers you have the cutting points opposite, while with three chasers, as soon as one chaser becomes dull, it crowds the metal between the other two, thereby producing work that is not round.

Half as many parts: The Ideal Die has few parts and is easy to take apart and assemble.

Detachable Shank: The detachable shank makes it possible to use the same die in different sized machines.

Left and Right Hand Threads: The same die will cut either left or right hand threads; the former by simply changing index from right hand to left hand, and using left hand chasers.



Size	¼ inch	½ inch	¾ inch	1 inch	1¼ inch
Diameter of head	1 11/16 in.	2¼ in.	2 15/16 in.	3 9/16 in.	4 11/16 in.
Length of head	1⅝ in.	1⅞ in.	2½ in.	2¾ in.	3½ in.
Diameter of shank	⅝ or ¾ in.	⅞ or 1⅛ in.	1¼ or 1½ in.	1½ or 1¾ in.	1¾ or 2¾ in.
Length of shank	2 in.	2½ in.	3 in.	4 in.	4¼ in.
Length over all	3⅝ in.	4⅜ in.	5½ in.	6¾ in.	7¾ in.
Capacity	3/32 to ¼ in.	⅛ to ½ in.	¼ to ¾ in.	⅜ to 1 in.	½ to 1¼ in.
Chasers in set	4	4	4	4	4
With 1 set of chasers	$25.00	$30.00	$40.00	$50.00	$65.00
Extra shanks, each	4.00	5.00	6.00	7.00	8.00
Standard chasers per set	1.25	1.50	2.00	2.50	3.00
Special chasers per set	2.00	2.50	3.00	3.50	4.00
H. S. Steel Extra	1.00	1.00	1.00	1.00	1.00

One set of Standard pitch chasers, either U. S. V. or Whitworth, right or left hand furnished with die.

For sizes desired not listed in table above send specifications.

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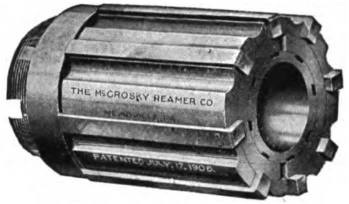
THE McCROSKY REAMER CO.

MEADVILLE, PA.

ADJUSTABLE REAMERS, EXPANDING MANDRELS, WIZARD QUICK-CHANGE CHUCKS AND COLLETS, WIZARD VARIABLE SPEED AND REVERSING ATTACHMENT for drill press, SEARCHLIGHT UNIVERSAL LAMP BRACKETS for shop and drafting room, AND OTHER COST-CUTTING SPECIALTIES.



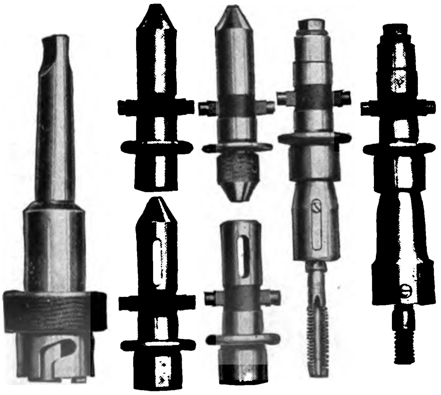
THE IDEAL REAMER PATENTED
THE McCROSKY REAMER CO. MEADVILLE PA

If you are in any way personally responsible for reaming results in your shop, you should familiarize yourself with this line of reamers. All styles and sizes from ¾" to 10". High speed or carbon. Unequalled in design, unexcelled in workmanship and material, combining all the advantages of both solid and adjustable reamers without the disadvantages of either.

Hundreds of the largest and best shops have adopted these reamers as standard equipment. We solicit the privilege of figuring on your requirements.

WIZARD QUICK-CHANGE CHUCKS AND COLLETS

will revolutionize any drill press job where it is desired to use more than one tool in succession. Takes all sizes and kinds of tools, such as drills, taps, reamers, special tools, etc., in rapid succession without stopping the machine. On many jobs will show 50% saving. Embodies several important features not found in any similar device. Wizard friction drive collets are unequalled for tapping and stud setting. Wizard No-Needa-Tang collets reclaim broken tang drills and forever end all tang troubles.



Try a Wizard outfit on thirty days approval and watch it make dollars for you. We take the risk.

Our complete catalog of cost-cutting tools sent on request.

NORTON COMPANY

WORCESTER, MASS. U. S. A.

New York Store
151 Chambers St.

Chicago Store
11 N. Jefferson St.

Electric Furnace Plants
Niagara Falls, N. Y.—Chippawa, Can.

Manufacturing Plants
Worcester, Mass.—Wesseling, Germany

ALUNDUM AND CRYSTOLON GRINDING WHEELS, ALUNDUM AND CRYSTOLON GRAIN FOR POLISHING, ALUNDUM REFRACTORIES AND LABORATORY WARE, GLASS CUTTING WHEELS, INDIA OIL STONES AND CRYSTOLON SHARPENING STONES, RAZOR HONES, SCYTHE STONES, VALVE GRINDING COMPOUND, RUBBING BRICKS AND STONES, GRINDING WHEEL DRESSERS, GRINDING MACHINERY.

ALUNDUM (Al_2O_3) is made from Bauxite by fusion in an electric arc furnace. Its hardness, sharpness and toughness—"temper"—are under control. This, in combination with its characteristic conchoidal fracture, makes Alundum grinding wheels peculiarly effective upon materials of high tensile strength—notably steel and its alloys.

CRYSTOLON is Silicon Carbide (SiC) in crystalline formation. By the use of the purest materials and a scientifically correct process, an abrasive material of wonderful purity and remarkable cutting qualities is obtained. Its characteristic property of brittleness makes it highly efficient upon cast iron, brass, marble and other materials of low tensile strength.

REFRACTORIES—Until the invention of the process for making Alundum, Bauxite was considered infusible. This well-known property has made Alundum especially valuable as a refractory material. Alundum is made into Electric Furnace Cores, Tubes and Muffles; Crucibles, Combustion Boats, Filtering Crucibles and Cones, Extraction Thimbles and Refractory Cements.

Any of these booklets upon request: Alundum, Catalog of Grinding Wheels, Alundum-Crystolon Grinding Wheels, Alundum Grain for Polishing, Alundum and Crystolon in the Glass Industry, Norton Alundum Refractories, Helps—Don'ts For All Who Grind, Grinding Wheels for the Saw Mill, Norton Valve Grinding Compound.

SPECIAL RESEARCH SERVICE

We have well equipped research laboratories with a competent staff of research workers and demonstrators who are always ready to give you the benefit of their special knowledge and wide experience in the solving of your special problems.

Alundum NORTON Crystolon

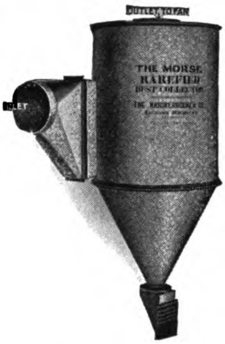
THE KNICKERBOCKER COMPANY

JACKSON, MICH.

MANUFACTURERS OF DUST COLLECTORS AND CONCRETE MIXERS

THE MORSE RARIFIED DUST COLLECTOR

For Emery Wheels, Polishers, Sand Blast and Tumbling Mills



This Collector operates on the "Rarified" or partial vacuum principle, a constant vacuum tendency being maintained in the collector casing and a separation of the material from the air current secured *before the air reaches the fan*. In handling all products of metallic or flinty character, this feature of the "Rarified" is particularly valuable as the abrasion on the fan parts is practically eliminated, while there is no undue wear on the collector parts.

With the " Rarefied " Collector—The suction never varies, all dust heavier than air is collected, material collected is discharged automatically, there is no cleaning out by hand, there is no cloth or screens to fill up, there are no moving parts, the cost of repairs is slight.

This Collector is built all galvanized sheet steel with angle iron rings. All parts riveted two inch centers. Gauge of sheet steel used depends on suction required to do the work and class of material to be handled.

The "Rarefied" must be placed ahead of the fan with the latter always exhausting to the atmosphere above the roof. Size of "Rarefied" to be used must be two numbers larger than diameter of suction pipe. If fan has 12 inch suction pipe, at least a No. 14 "Rarified" should be installed, etc.

No.	Height Top Wall	Length of Cone	Length of Trap	Height Over All	Outside Diam.	Inlet Opening	Area	Diam. Outlet leading to Fan	Diam. Dust Outlet
2	15½″	11½″	10½″	3′ 1½″	15″	1¾″x 8½″	15″	2″	2″
3	18″	13½″	10½″	3′ 6″	17″	2¼″x10″	22½″	3″	3″
4	20½″	15½″	10½″	3′ 10½″	19″	2¾″x11½″	31½″	4″	3″
5	23″	17½″	10½″	4′ 3″	21″	3¼″x13″	42″	5″	3″
6	2′ 1½″	19½″	10½″	4′ 7½″	1′ 11″	3½″x14½″	51″	6″	3″
7	2′ 4″	21½″	10½″	5′ 0″	2′ 1″	4″ x16″	64″	7″	3″
8	2′ 6½″	22″	11½″	5′ 4″	2′ 3″	4½″x17½″	79″	8″	4″
9	2′ 10″	2′ 0″	11½″	5′ 9½″	2′ 5″	5″ x20″	100″	9″	4″
10	3′ 0½″	2′ 2″	11½″	6′ 2″	2′ 7″	5½″x21½″	118½″	10″	4″
11	3′ 3″	2′ 4″	11½″	6′ 6½″	2′ 9″	6″ x23″	138″	11″	4″
12	3′ 5½″	2′ 5″	13″	6′ 11½″	2′ 11″	6½″x24½″	159½″	12″	5″
13	3′ 8″	2′ 7″	13″	7′ 4″	3′ 1″	7″ x26″	182″	13″	5″
14	3′ 10½″	2′ 9″	13″	7′ 8½″	3′ 3″	7½″x27½″	206½″	14″	5″
15	4′ 1″	2′ 11″	13″	8′ 1″	3′ 5″	8″ x29″	232″	15″	5″
16	4′ 3½″	3′ 0″	14½″	8′ 4½″	3′ 7″	8½″x30½″	259½″	16″	6″
17	4′ 6″	3′ 2″	14½″	8′ 10½″	3′ 9½″	9″ x32″	288″	17″	6″
18	4′ 8½″	3′ 4″	14½″	9′ 3″	3′ 11½″	9½″x33½″	318½″	18″	6″
19	4′ 11″	3′ 6″	14½″	9′ 7½″	4′ 1½″	10″ x35″	350″	19″	6″
20	5′ 1½″	3′ 7″	16″	10′ 0½″	4′ 3½″	10½″x36½″	383½″	20″	7″
21	5′ 4″	3′ 9″	16″	10′ 5″	4′ 5½″	11″ x38″	418″	21″	7″
22	5′ 6½″	3′ 11″	16″	10′ 9½″	4′ 7½″	11½″x39½″	454½″	22″	7″
23	5′ 9″	4′ 0″	16″	11′ 1″	4′ 9½″	12″ x41″	492″	23″	7″
24	5′ 11½″	4′ 3″	16″	11′ 6½″	4′ 11½″	12½″x42½″	531½″	24″	7″
25	6′ 2″	4′ 5″	16″	11′ 11″	5′ 1½″	13″ x44″	572″	25″	7″
26	6′ 4½″	4′ 7″	16″	12′ 3½″	5′ 3½″	13½″x45½″	614½″	26″	7″
27	6′ 7″	4′ 9″	16″	12′ 8″	5′ 5½″	14″ x47″	658″	27″	7″
28	6′ 9½″	4′ 10″	17½″	13′ 1″	5′ 7½″	14½″x48½″	703½″	28″	8″
29	7′ 0½″	5′ 0″	17½″	13′ 6″	5′ 9½″	15″ x50½″	757½″	29″	8″
30	7′ 3″	5′ 3″	17½″	14′ 0″	5′ 11½″	15½″x52″	813″	30″	8″
31	7′ 5½″	5′ 5″	17½″	14′ 4½″	6′ 1½″	16″ x53½″	864″	31″	8″
32	7′ 7½″	5′ 7″	17½″	14′ 8″	6′ 3½″	16½″x55″	907″	32″	8″
33	7′ 10″	5′ 9″	17½″	14′ 11½″	6′ 5½″	17″ x56½″	960″	33″	8″
34	8′ 0½″	5′ 11″	17½″	15′ 6″	6′ 7½″	17½″x58″	1015″	34″	8″
35	8′ 3′	6′ 1″	17½″	15′ 8½″	6′ 9½″	18″ x59½″	1071″	35″	8″
36	8′ 5½″	6′ 3″	17½″	16′ 1″	6′ 11½″	18½″x61″	1107″	36″	8″
37	8′ 8″	6′ 5″	17½″	16′ 5½″	7′ 1½″	19″ x62½″	1180″	37″	8″
38	8′ 10½″	6′ 7″	17½″	16′ 10″	7′ 3½″	19½″x64″	1248″	38″	8″
39	9′ 1″	6′ 9″	17½″	17′ 2½″	7′ 5½″	20″ x65½″	1310″	39″	8″
40	9′ 3½″	6′ 11″	17½″	17′ 7″	7′ 7½″	20½″x67″	1373″	40″	8″

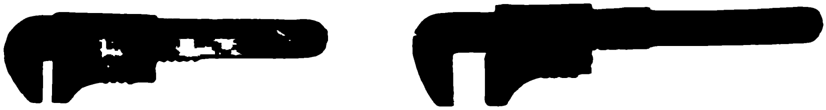
FRANK MOSSBERG COMPANY

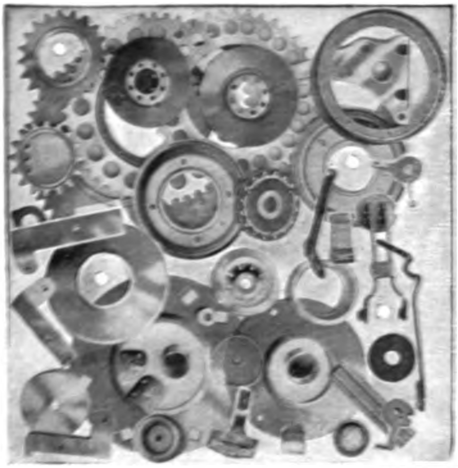
ATTLEBORO, MASS.

MANUFACTURERS OF WRENCHES, BELLS, REELS, BEAMS, SPOOLS, METAL STAMPINGS AND PUNCHING DIES; SPECIAL MACHINERY; AUTOMOBILE PARTS.

155 different kinds of wrenches for all kinds of work—but only one quality—**The Best.** Every wrench **absolutely guaranteed.**

Mossberg socket wrench sets with No. 350 Mossberg ratchet handle and any combination of sockets.





METAL STAMPINGS

We are specialists in steel stamping, drawing and punching and have developed the art of working steel to a high degree.

We are prepared to furnish stampings large or small, either rough or as finished parts. Our product includes finished motor cycle and automobile parts, finished clock parts and finished parts for all classes of light machinery, besides a wide variety of rough stampings.

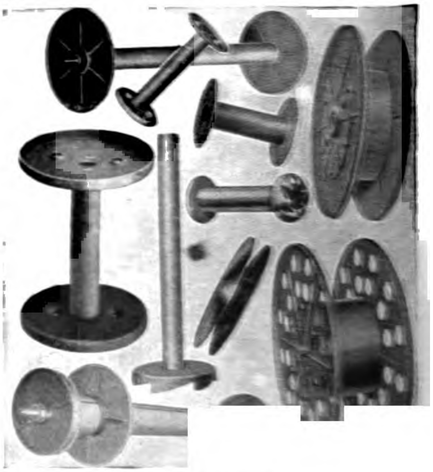
We particularly solicit inquiries for manufacturing finished parts for small machines. We guarantee all our work to be strictly high grade in every respect.

REELS—BEAMS—SPOOLS

We are pioneers in the manufacture of metal reels, beams, spools, etc. We were the first to use steel for this purpose. To-day it is generally recognized that Mossberg stamped steel reels, etc., not only are more satisfactory for general use but, owing to their low cost and greater durability, they are also more economical.

We solicit an opportunity to demonstrate this.

We are prepared to furnish reels, etc., from the smallest commercial size up to the big 72″ cable reels—weighing 950 pounds each.



Complete Catalog On Request.

J. H. WILLIAMS & CO.

BROOKLYN, N. Y.

DROP-FORGINGS

THE W HANDBOOK OF SUPERIOR DROP FORGINGS

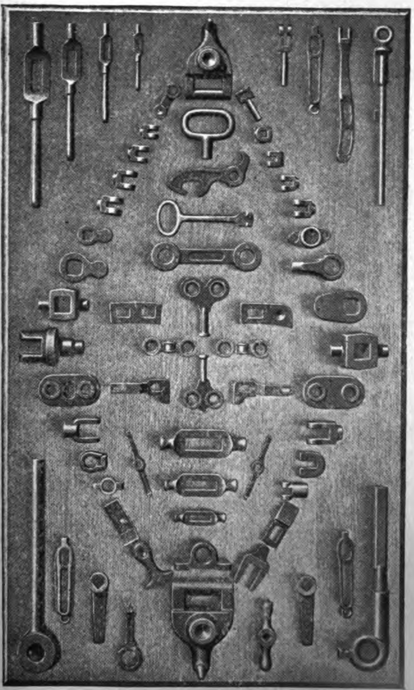
The pocket size book will not only show you the latest standard prices of our many drop-forged stock tools and accessories, but should convince you of our ability to take care of such "made to order" pieces as you may require in connection with your business affiliations.

**It will prove a handy reference
book to you for anything in
Superior Drop-forgings!**

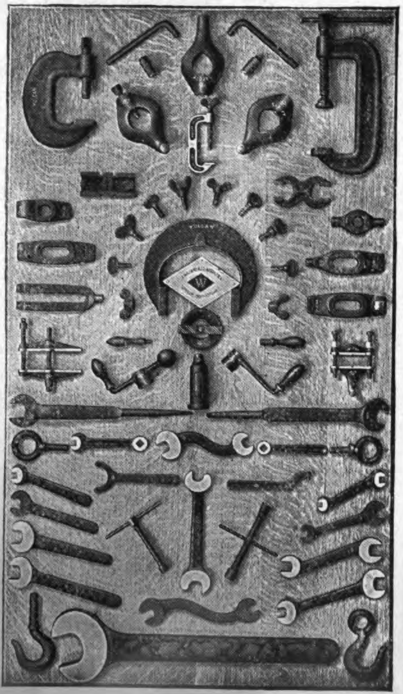
Among the new lines of Drop-forged tools you will notice that the "Vulcan" Safety Lathe Dogs are so constructed that all danger from sleeve contact has been eliminated.

The new "Agrippa" Clamps present unusual features at same price customarily paid for the cast steel product. The drop-forged "Agrippa" Clamps are lighter, stronger, have greater utility and will accomplish everything possible with the heaviest form of cast steel product.

Moreover, you will find interest in a number of other tools which possess points of merit and convenience unique to themselves; secure the book!



Special Forgings

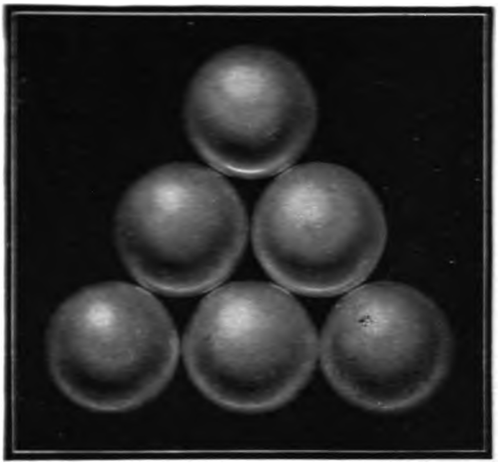


Stock Forgings

ATLAS BALL COMPANY

PHILADELPHIA

ATLAS BALLS - ATLAS BALL GAUGES



ATLAS BALLS GUARANTEED ROUND AND TRUE WITHIN $\frac{1}{10,000}$ OF AN INCH.

The ATLAS process of making balls is the most highly perfected process known in the steel-ball industry. It not only comprises the result of several years of patient study and research on our part but also embraces the best European method of ball making, for we have purchased and have sole control of the entire United States patents of Ernest Gustav Hoffman relating to the manufacture of steel balls.

ATLAS Balls are made from imported chrome-alloy steel, hot-forged in strings and afterwards cut apart. The forged balls are carefully inspected, then annealed to remove any internal strain set up by the forging process.

This produces a state of rest or repose in the steel, rendering the balls soft and mild, AND ALL ALIKE, insuring the uniformity so essential to the success of the finished ball.

After "ageing" for some time, the balls are rough-ground, smooth-ground, then subjected to a special heat treatment, hardened and tempered, precision ground, polished, rigidly inspected and guarantee-tagged.

Our catalog, "A masterpiece of the printer's art," sent on request.

ATLAS BALL COMPANY

PHILADELPHIA

ATLAS BALLS - ATLAS BALL GAUGES

ATLAS BALL GAUGE—AN ATLAS BALL WITH A HANDLE ON IT

The Atlas Ball Gauge is made by electric-welding the perfect ATLAS Ball to a knurled handle. Its cost, on an average, is only one-third that of a plug gauge.

With an ATLAS Ball Gauge, the mechanic works closer to his limit diameter without fear of excess, for the "round" of the ball guides him as he works up to the final diameter of the ball—the desired measure.

It replaces, to a large extent, the plug gauge, inside calipers, etc., for measuring internal diameters on ball bearings, circular saws, gear wheels, pulleys, hollow mills, formed cutters, discs, collars, bearings, bushings, machine parts and in many other places that will suggest themselves to the mechanic.

The welding process used to unite ball and handle is the result of months of experimenting. The ball is NOT DISTORTED.

Besides the low, original cost, ATLAS Ball Gauges are more durable than any other instrument. Wear is evenly distributed over the surface of the ball, right up to the ferule.

Interesting book, "The New Method of Measuring Internal Diameters," sent on request.

THE CINCINNATI BALL CRANK CO.

CINCINNATI, OHIO

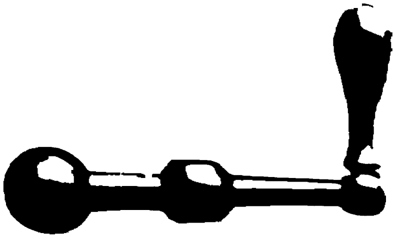
STEEL PRODUCTS

HANDLES FROM STEEL

For power tools and similar purposes

Milled, bored, drilled, tapped and key-seated to specifications. Highly finished [illegible] ready to attach.

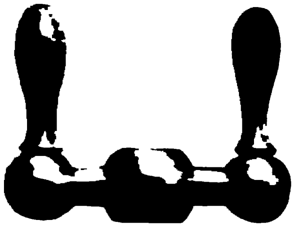
STEEL BALL CRANK MACHINE HANDLES



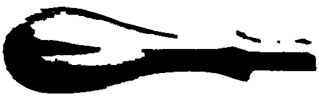
Size	Length Over All	Center Ball	Large End Ball	Small End Ball
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Center ball can be drilled and faced any size desired.

COMPOUND REST HANDLES



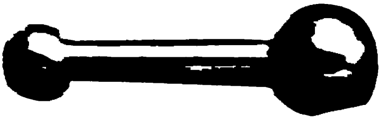
MACHINE HANDLES



[illegible]	Length Over A	Diameter Shank
[illegible]	[illegible]	[illegible]

[illegible] BALL LEVERS

[illegible]



[illegible]

CLEVELAND CITY FORGE & IRON CO.

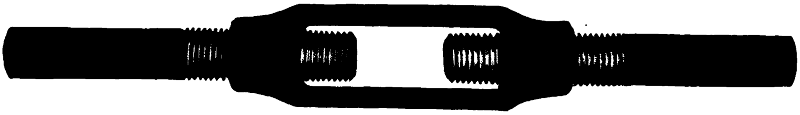
CLEVELAND, OHIO

11 Broadway, New York

Ford Bldg., Detroit, Mich.

IRON AND STEEL FORGINGS

TURNBUCKLES



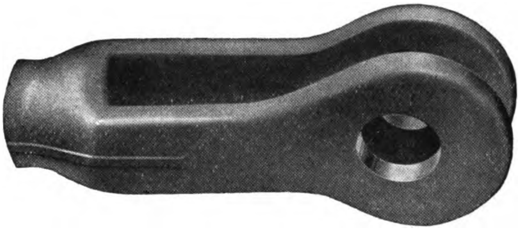
The "Cleveland" Turnbuckle has been adopted as STANDARD by the United States Government Engineers and is specified by them on Government work.

It is guaranteed STRONGER than any medium steel rod which it fits.

The metal is so distributed in the various sections that a maximum of strength is obtained.

The OPEN CONSTRUCTION is very desirable. The bolt ends are always in sight, allowing inspectors to readily see that they have a good hold on the thread, and also that the ends do not butt together. This form of turnbuckle can be adjusted with a bar or wrench.

CLEVIS NUTS



The standard Clevis Nuts which we manufacture are acknowledged to be the best and neatest in design of any in the market.

The PIN connection is on a dead center with the head.

The PIN HOLES are true in line, being drilled by special machinery.

LIGHT FORGINGS

Automobile Forgings a specialty and Drop Forgings of every description—Journal Box Wedges; Center Plates.

Bulldozer and Upsetting Work, including all manner of Car Forgings and Structural Rods.

HEAVY FORGINGS

Marine:—Rudder Frames, Rudder Stocks, Stern Frames, etc.

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Rolls:—Bending, Sugar Mill.

General Steam Hammer work.

PRESSED STEEL PRODUCTS

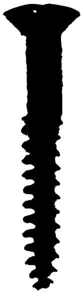
We have a full equipment of Heavy Hydraulic Presses for both hot and cold pressed work:—Steel Car Doors, Carlines, Automobile and Truck Frames.

AMERICAN SCREW COMPANY

PROVIDENCE, R. I.

[illegible] IN WOOD SCREWS, MACHINE SCREWS, STOVE BOLTS, [illegible] BOLTS, RIVETS, ETC.

[illegible]



[illegible]

WOOD SCREWS

[illegible] and Round Head Wood Screws are regularly made in [illegible] following sizes, and in [illegible] approximately the same variety. Other kinds of Wood Screws are made in the [illegible] commonly used.

Length	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Min. No.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Max. No.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Length	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Min. No.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2	2	2
Max. No.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	30	30	30

[illegible] No. 0 1 2 3 4 5 6 7 8 9 10 [illegible]

MACHINE SCREWS

[illegible] Round, and Fillister Head Machine Screws are regularly made in Iron [illegible] following sizes, and in Brass in sizes of approximately the same variety:

Length	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Min. No.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	4	4	4	4
Max. No.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	34	34	34	32
Length	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	5	6	
Min. No.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	12	12	14	14	16	
Max. No.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	30	30	30	30	30	

[illegible] No. [illegible] 10 12 14 16 18 20 22 24 26 28 30 32

Flat Head

Round Head

Fillister Head

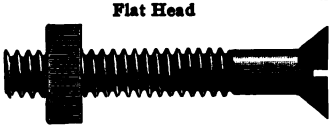
Diameter No.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	8	9.10	12	14
Threads	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	24.30.32	20.24	18.20.24

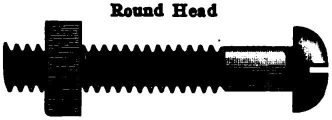
Regular [illegible] Knob Screws are ¾ inch No. 9, 24 thread.

See also next page.

AMERICAN SCREW COMPANY

STOVE BOLTS





Flat and Round Head Iron Stove Bolts are regularly made in the following sizes:

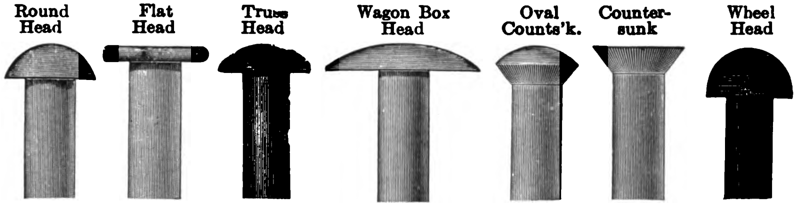
Diameter	1/8	5/32	3/16	7/32	1/4	5/16	3/8	1/2
Min. Length	3/8	3/8	3/8	1/2	1/2	3/4	3/4	1
Max. Length	2	2	6½	6½	6½	6½	6½	3

The length advances by eighths of an inch from 3/8 to 1/2, then by quarters to 6½.

STOVE RODS

Stove Rods are the same as Stove Bolts in every respect excepting length. They are regularly made in Iron of 3/16 and 1/4 diameter in length from 7 to 40," advancing by halves of an inch.

RIVETS



Cold-headed Rivets are made in great variety of styles and sizes up to 7/16 in diameter and 6 in length.

MEASUREMENTS

The length includes the head of Flat Head Screws, Stove Bolts, and Stove Rods; excludes the head of Round and Fillister Head Machine Screws and Round Head Stove Bolts and Stove Rods; includes the countersink of Oval Head Screws and about half the head of Round Head Wood Screws, but the practice with regard to Round Head Wood Screws is not uniform with all makers.

The length of Rivets is exclusive of the head for all styles with a right angle under the head, and inclusive of the countersink for countersunk heads.

The diameter of Screws is measured by the American Screw Gauge, the equivalent in inches being:

0	.0578	5	.1236	10	.1894	15	.2552	22	.3474
1	.0710	6	.1368	11	.2026	16	.2684	24	.3737
2	.0842	7	.1500	12	.2158	17	.2816	26	.4000
3	.0973	8	.1631	13	.2289	18	.2947	28	.4263
4	.1105	9	.1763	14	.2421	20	.3210	30	.4526
								34	.5053

The diameter of Rivets is measured by the Old Standard Birmingham Wire Gauge, the equivalent in inches being:

000	.425	2	.284	6	.203	10	.134	14	.083
00	.380	3	.259	7	.180	11	.120	15	.072
0	.340	4	.238	8	.165	12	.109	16	.065
1	.300	5	.220	9	.148	13	.095	17	.058
								18	.049

See also preceding page.

RUSSELL, BURDSALL AND WARD BOLT AND NUT COMPANY

ROCK FALLS, ILL.

BOLTS AND NUTS

[illegible]

[illegible]

THE DUFF MANUFACTURING CO.

N. S. PITTSBURG, PA., U. S. A.

GENUINE BARRETT JACKS; DUFF BALL-BEARING SCREW JACKS; DUFF-BETHLEHEM FORGED STEEL HYDRAULIC JACKS; GEARED RATCHET LEVER JACKS; AUTOMOBILE JACKS; TELESCOPE SCREW JACKS; OIL WELL JACKS; PIPE FORCING JACKS; MOTOR ARMATURE LIFTS, ETC.

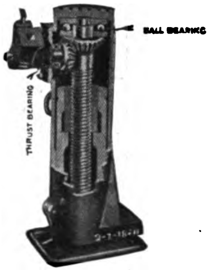
BARRETT TRACK AND AUTOMATIC LOWERING JACKS.

are made both single and double acting, in every type and size—for every purpose, ranging in capacity from ¾ to 20 tons.

They are quick acting, positive and durable, and will operate on continuous work at low maintenance cost.

They comprise the most popular line of lifting jacks in the world and are recognized as the standard by all leading railroads.

DUFF BALL-BEARING GEARED SCREW JACKS.

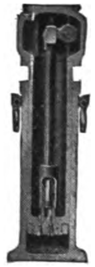


Sectional View

Are constructed of refined malleable iron and steel. All gears are of high carbon steel, drop forged, and have machine-cut teeth.

The load is carried on a large ball bearing of special design, reducing friction to an absolute minimum. The thrust on the bevel pinion is taken by another anti-friction bearing, an exclusive feature. Made in all sizes and capacities ranging from 10 tons to 75 tons.

THE DUFF-BETHLEHEM FORGED STEEL HYDRAULIC JACKS



Sectional View

Forged entirely out of steel—the latest and highest development in Hydraulic Jacks, they are more powerful, yet from 30 to 60% lighter than any other Hydraulic Jacks.

The design embodies no joints, few packings and but a third the number of parts of other jacks of similar type.

These jacks cause no trouble, are used at any angle, and operate at low cost under continuous service.

Made in 101 sizes and capacities, ranging from 10 to 500 tons.

COMPLETE INFORMATION.

Concerning the above and other types of lifting jacks may be secured by addressing this company.

THE JOYCE-CRIDLAND CO.

DAYTON, OHIO

MANUFACTURERS OF ALL STYLES OF LIFTING JACKS: HYDRAULIC, LEVER, AUTOMATIC, GEARED AUTOMATIC, SCREW, TRAVERSING, JOURNAL, ETC.

HYDRAULIC JACKS

Inside Pump Type

[illegible]

Outside Pump Type

INSIDE PUMP TYPE

Single Pump — Double Pump

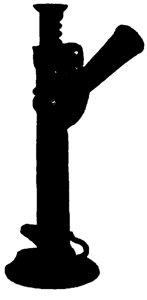
[illegible]

THE JOYCE-CRIDLAND CO.

PLAIN LEVER JACKS

These Jacks are especially suited for small and medium loads where the jack must be applied in various different ways, and under rugged conditions.

Jack No.	Height when Down, Ins.	Rise of Bar, Ins.	Size of Bar, Ins. (Square)	Weight of Jack, Pounds	Capacity, Tons
1a	16	8¼	1¼	24	2
2a	18½	10	1¼	28	2
3	11½	4	1½	27	4
4	22½	14	1½	40	4
4a	18½	10½	1½	37	4
4e	41½	35	1½	60	4
4f	36	30	1½	55	4
6	26½	14	2	92	15
7	35	25½	2	115	15
10	27	16	1¾	76	10
10a	22½	11½	1¾	63	10


Plain Lever Jack

FULL AUTOMATIC LEVER AND GEARED JACKS

Full Automatic Lever Jacks are full automatic in raising and lowering, action being controlled by reversing lever on outside of frame. They are composed of few working parts and are more powerful than any type of plain lever jacks.

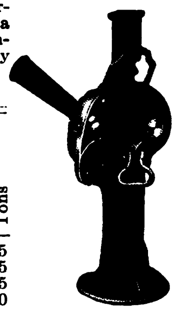
In the Full Automatic Geared Jacks, by means of a gear and pinion, interposed between the lever and lifting bar, one can lift with the same effort a weight four times as great as with a plain lever jack. This jack is of the simplest possible construction considering its full automatic features. For heavy service and severe usage.

AUTOMATIC LEVER JACKS

Jack No.	Ht. of Bar, Down, Ins.	Rise of Bar, Ins.	Size of Bar, Ins. (Sq.)	Weight, Pounds	Capacity, Tons
66	13½	6½	1¼	33	4
67	16	8	1¼	34	4
68	19	11	1¼	39	4
*74	11	5	1½	35	10
76	22¼	14¼	1½	54	10
80	22	10	1¾	80	12
81	27	15	1¾	88	12
84	22	12	2	90	15
85	26½	16	2	105	15
86	36	25	2	128	15

AUTOMATIC GEARED JACKS

Jack No.	Ht. when Down, Ins.	Rise of Bar, Ins.	Rise per Str. of Lever, Ins.	Size of Bar, Ins.	Weight, Pounds	Capacity, Tons
293	24	14	⅛	2½x3	175	35
295	27	17	⅛	2½x3	190	35
296	33	23	⅛	2½x3	215	35
397	22	12	⅛	3 x3	250	50
398	24	14	⅛	3 x3	260	50
399	25⅝	15½	⅛	3 x3	265	50
400	27¼	17	⅛	3 3x	268	50
401	36	26	⅛	3 x3	300	50
402	31	21	⅛	3 x3	282	50


Full Automatic Geared Jack

*This jack is shortened for journal box work.

GEARED SCREW JACKS

The "J-C" Geared Screw Jack gives the greatest speed consistent with safety. Entire working parts can be removed through top of jack without taking sleeve off standard. Nut is locked, preventing it being pulled out while jack is being carried or handled, and has a positive stop which prevents screw from being run out of nut.

Jack No.	Ht. when Down, Ins.	Rise of Screw, Ins.	Diam. of Screw, Ins.	Weight, Pounds	Capacity, Tons
154RB	22	13	2	114	25
154SB	"	"	"	114	"
154GL	"	"	"	119	"
155RB	26	17	2	128	25
155SB	"	"	"	128	"
155GL	"	"	"	133	"
156RB	34	25	2	157	25
156SB	"	"	"	157	"
156GL	"	"	"	162	"
157RB	20	11	2½	161	35
157SB	"	"	"	161	"
157GL	"	"	"	168	"
158RB	22	13	2½	172	35
158SB	"	"	"	172	"
158GL	"	"	"	180	"
159RB	24	15	2½	183	35
159SB	"	"	"	183	"
159GL	"	"	"	191	"
160RB	27	18	2½	200	35
160SB	"	"	"	200	"
160GL	"	"	"	208	"

Jack No.	Ht. when Down, Ins.	Rise of Screw, Ins.	Diam. of Screw, Ins.	Weight, Pounds	Capacity, Tons
161RB	30	21	2½	217	35
161SB	"	"	"	217	"
161GL	"	"	"	225	"
162RB	33	24	2½	234	35
162SB	"	"	"	234	"
162GL	"	"	"	242	"
164RB	24	13½	2¾	220	50
164SB	"	"	"	220	"
164GL	"	"	"	230	"
165RB	27½	17	2¾	243	50
165SB	"	"	"	243	"
165GL	"	"	"	253	"
166RB	31	21	2¾	267	50
166SB	"	"	"	267	"
166GL	"	"	"	277	"
168RB	38	28	2¾	314	50
170RB	27	14½	3	288	70
170SB	"	"	"	288	"
170GL	"	"	"	300	"

Geared Screw Jack, Square Base with Ground Lift

[illegible]BURN STEEL COMPANY

[illegible]BURN, PENNSYLVANIA

"THE TOOL STEEL MILL"

GRADES [illegible]

[illegible] steels [illegible] extra [illegible] They are made [illegible] chemical analysis and method [illegible] working properties [illegible] reference to our catalogue [illegible] regarding these steels.

GRADE 4

[illegible] Tools [illegible] of tools where special endurance is [illegible] toughness are required. This steel is made in [illegible]

GRADE 5

[illegible] one temper only for Turning, Planing, [illegible] any other hard material, and especially for [illegible] a fine edge [illegible] tools which have to withstand shocks [illegible]

[illegible] given more time in heating for hardening [illegible] using light blows [illegible] hardening, temper [illegible]

[illegible] tools made from this steel.

GRADE 6

[illegible] only in one temper for Milling [illegible] Reamers, Broaches [illegible] shall be neither contraction nor expansion

[illegible] and uniformly to a [illegible] temper and draw the temper [illegible] this manner it is very tough and [illegible] obviates all contraction and expansion.

GRADE 7

[illegible] especially recommended for [illegible]

HARDENING

[illegible] be cut or [illegible] It is suitable for [illegible]

[illegible] SPEED STEELS

[illegible] and "High Speed Special" [illegible] Boring Tools [illegible] capable of doing [illegible] work [illegible] cuts and coarse feed at [illegible]

[illegible] for purposes [illegible] adapted more [illegible] recommend the use of this steel [illegible] is desirable [illegible] This steel [illegible] longer and stands greater [illegible] is hardly necessary [illegible]

GRADE [illegible]

[illegible] Shafts, Forgings, [illegible] Lawn Mowers, [illegible] Hooks, Files, etc. [illegible]

THE COLONIAL STEEL COMPANY

PITTSBURGH, PENNSYLVANIA

HIGH GRADE STEEL

COLONIAL HIGH SPEED STEEL

Adapted for the heaviest cuts or the highest speeds on all classes of material. Colonial High Speed Steel is made in one grade only and is capable of doing any class of work for which high speed steel is suited.

COLONIAL BEST TOOL STEEL, WATER HARDENING

An alloy steel adapted for fine finishing cuts, such as forming tools, cutters, hobs, threading dies, etc.; for brass and copper lathe tools, and other purposes where machines are not equipped to use high speed tool steel.

COLONIAL NO. 7 TOOL STEEL, WATER HARDENING

A vanadium tool steel of great strength and toughness; made from pure wrought iron, and suitable for high-class tools of all kinds, especially those subject to strain or stress of any kind through repeated action or repeated shock.

COLONIAL SPECIAL TOOL STEEL, WATER HARDENING

A straight carbon tool steel, made from pure melting iron. Suitable for shop tools of all kinds.

RED STAR TOOL STEEL

Standard grade for ordinary purposes.

RED STAR DRILL STEEL

For rock drilling purposes.

NICKEL STEEL—CHROME VANADIUM STEEL

Bars and Sheets made in small furnaces and carefully melted to insure homogeneous steel. Furnished free from pipes, seams and all defects.

30 PER CENT NICKEL STEEL BARS and SHEETS

Anti-corrosive. Used for valve stems and parts of internal combustion engines. or other purposes where material is desired that will not rust or corrode.

SHEET STEEL

For knives and tools of all kinds, springs, agricultural implements, etc.

SOFT CENTER PLOW STEEL

Made in slabs or sheared to pattern, carefully manufactured, and special attention given to the toughness of center, and rigidly inspected.

FIVE PLY JAIL BARS AND SAFE PLATES

Send for Catalog

Steel Shafting, Screw Steel

COLUMBIA STEEL & SHAFTING CO.

PITTSBURG, PA.

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BOSTON, MASS.

1243 Peoples Gas Bldg.
CHICAGO, ILL.

906 B. of L. E. Bldg.
CLEVELAND, OHIO

Pittsburg Shafting Co.
DETROIT, MICH.

90 West Street
NEW YORK, N. Y.

TURNED AND POLISHED, AND COLD DIE ROLLED STEEL SHAFTING; FREE CUTTING SCREW STEEL; COLD DRAWN ROUNDS, SQUARES, HEXAGONS, FLATS AND SPECIAL SHAPES; PUMP AND PISTON ROD STEEL; AND SPECIAL HIGH CARBON AND ALLOY STEEL.

"COLUMBIA" TURNED AND POLISHED SHAFTING

The superiority of turned shafting, for certain purposes, over the product of the cold drawing and cold rolling processes, is well known to most users. For transmission purposes in particular, it is most preferable, since by the turning process the structure of the steel is not changed and the shaft can be key-seated without the results produced by the same operation on a cold drawn or cold rolled product.

In this class of work we use the best quality of machinery steel obtainable for the purpose; the bars finished by our method are highly polished, absolutely true to gauge and accurately straightened; in short, the material is handled with all the care and minute attention to details affecting quality that characterizes our entire line of manufacture.

All "Columbia" Shafting in sizes 2 3/16 inches and larger is turned and polished (unless otherwise desired), and we are equipped to furnish smaller sizes so finished if ordered in sufficient quantities.

FREE CUTTING SCREW STOCK

After many years of careful experiment, we have adopted and now use for this purpose a specially selected analysis steel, which, owing to its absolute free cutting and threading properties, has emphatically proven among the authoritative consuming trade to be admirably suited and best adapted for use at high speed, with maximum production of parts, in such as the automatic and hand screw machine and turret lathe operations.

Complete equipment with every facility to offer the very best products provides, and extreme care with close attention to the requirements of the [illegible] insures such uniformity of structure and accuracy sufficient to firmly substantiate the claim of superiority based on expression of trade opinion in "Columbia" Free Cutting Screw Steel.

This material can be furnished in round, square or hexagon shape in almost any standard or special size required.

The illustrations shown above are reproduced from parts furnished us through the courtesy of some of our customers, these parts having been made from "Columbia" Free Cutting Screw Steel.

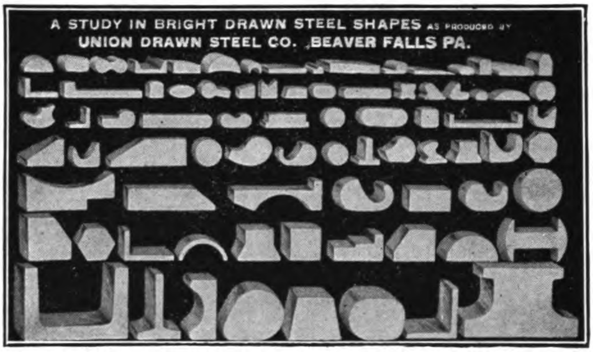
UNION DRAWN STEEL COMPANY

Works and General Office

BEAVER FALLS, PA.

WAREHOUSES: NEW YORK, PHILADELPHIA, CHICAGO, CINCINNATI.
BRANCH SALES OFFICES: BOSTON, BUFFALO, ATLANTA.

MANUFACTURER OF BRIGHT FINISHED STEEL EXCLUSIVELY IN ROUNDS, SQUARES, HEXAGONS, FLATS AND SHAPES, SHAFTING, SCREW STEEL, AXLE STEEL, BESSEMER, OPEN HEARTH, CRUCIBLE, NICKEL AND VANADIUMS, DRAWN—COLD ROLLED AND TURNED STEEL.


A STUDY IN BRIGHT DRAWN STEEL SHAPES AS PRODUCED BY
UNION DRAWN STEEL CO. ,BEAVER FALLS PA.

SPECIAL SHAPES OF COLD DRAWN STEEL of any dimensions within our range and for all purposes, will be made in the shortest possible time consistent with perfection in quality, in accordance with specifications furnished, where sufficient quantity will justify equipment.

The most comprehensive stock of Bright and Finished Steel, Rounds, Squares, Hexagons and Flats carried at our branch warehouses, in addition to the large stock we carry at our mill.

We are the largest manufacturers of cold finished steel and iron for shafting and various machinery uses.

Established 1889, but rebuilt Fireproof Plant and all new machinery installed, 1911.

SHAFTING.—We use only the best quality of soft steel and are manufacturing under recent patents, covering machinery and appliances, by a process superior to anything known for producing work mathematically accurate as to size, absolute straightness, and a perfectly polished surface.

PISTON AND PUMP RODS.—For piston and pump rods we use a special grade of steel, and can produce them strictly uniform in size and quality, highly polished, perfectly straight, and of lengths up to 60 or 70 feet.

SCREW STEEL.—For this work we furnish a special analysis of steel, which, after years of experiment, has proved best adapted to free cutting and threading, and for the production of the maximum number of parts in the minimum of time, by the use of automatic and hand screw machines and Turret lathes.

SPECIAL STEEL.—For the various places where special grades of steel are required, our experience and facilities are such that we can promptly furnish material best adapted for the special requirements.

WHEELOCK, LOVEJOY & COMPANY

NEW YORK BOSTON

HIGH GRADE STEEL

Agents
THOMAS FIRTH & SONS, LTD.
[illegible]
[illegible]

FIRTH-STERLING STEEL COMPANY
[illegible]
[illegible]

WEST PENN STEEL CO.
[illegible]
[illegible]

Agents
GLOBE WIRE CO., LTD.,
SHARPSBURG, PA.
Polished Drill Rods, Needle Wire
Drawn Steel in Special Shapes

WEST LEECHBURG STEEL COMPANY,
PITTSBURG, PA.
Hot and Cold Rolled Strip Steel

BRIGHTMAN MFG. CO.,
COLUMBUS, OHIO
Turned, Ground and Polished
Shafting and Screw Stock

HY-TEN STEEL

[illegible] high [illegible] strength and elastic limit, especially intended for [illegible] with great strength [illegible]

[illegible] in rough sizes.

FIRTH-STERLING "BLUE CHIP" HIGH SPEED STEEL

[illegible] Tools, Milling Cutters, Drills, Reamers, Taps [illegible]

[illegible] following sizes and [illegible]

[illegible]
[illegible] Annealed
[illegible] Annealed
[illegible] Annealed
[illegible] Annealed

[illegible] from the mill.

FIRTH-STERLING TOOL STEELS

[illegible] Wheelock, Lovejoy [illegible]

[illegible] high grade [illegible]

[illegible]

ALLOY STEELS

[illegible] effective than carbon [illegible]

[illegible] purposes.

[illegible]

TOOL STEEL FOR [illegible] PURPOSES

THE AMERICAN BRASS COMPANY

WATERBURY, CONNECTICUT, U. S. A.

MILLS AND FACTORIES:

ANSONIA BRASS AND COPPER BRANCH,	ANSONIA, CONN.
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BRASS, COPPER AND GERMAN SILVER

IN EVERY VARIETY OF SHEETS, ROLLS, PLATES, WIRE AND RODS, MOULDINGS, ANGLES AND CHANNELS, CIRCLES, BLANKS AND SHELLS

SEAMLESS AND BRAZED TUBING

CONDENSER TUBES AND LOCOMOTIVE TUBES

TOBIN BRONZE AND PHOSPHOR BRONZE

RODS, PLATES AND SEAMLESS TUBING

EXTRUDED METAL

RODS, SPECIAL SHAPES AND PRESSED METAL PARTS

TURBINE BLADING AND CALKING STRIPS

OF BRASS OR CUPRO NICKEL

BENEDICT NICKEL WHITE METAL

SEAMLESS TUBING, SHEETS, WIRE, RODS AND INGOT

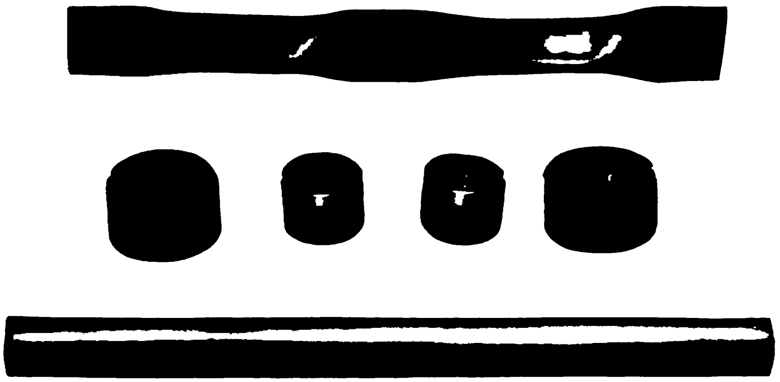
BARE AND INSULATED COPPER WIRE AND CABLES

"K. K." WEATHERPROOF AND SLOW BURNING WIRE, ROUND AND FLAT MAGNET WIRE

BRIDGEPORT BRASS COMPANY

96 Crescent Avenue BRIDGEPORT, CONN.

MANUFACTURERS OF SEAMLESS DRAWN BRASS AND COPPER TUBING FOR ALL PURPOSES, ALSO CONDENSER TUBES—BRASS AND ADMIRALTY MIXTURE, TINNED AND PLAIN, ALSO FERRULES OF ALL KINDS. "BRIDGEPORT" SEAMLESS TUBING IS GUARANTEED TUBING OF THE HIGHEST QUALITY.



Our experience in manufacturing high grade Condenser Tubes enables us to meet the most exacting requirements. We have made a careful study of this particular class of work, and with this experience and the most approved methods at our command, "*Bridgeport*" *Condenser Tubes* represent quality of the highest standard.

Every tube is rigidly tested and inspected before shipment is made.

The severity of the requirements in modern power station service demands the highest grade of Condenser Tubes—*For Condenser Tubes of Quality specify* "Bridgeport."

Bronzes. In rod and sheet.

"Bridgeport," a special bronze. Great tensile strength and high elastic limit, for shafting, piston or plunger work. Also Manganese, Aluminum, Phosphor and Silicon Bronze.

Special Shapes. Drawn or stamped from Brass, Copper, Bronze and German Silver We make the article from the ingot to the finished product. Send sample or blueprint for estimate of price.

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FABRICATED ALUMINUM

Kettles, tanks, coolers, evaporators, pipe lines and miscellaneous apparatus for chemical, soap, candle and stearic acid manufactures, also for preserving and brewery processes.

ELECTRICAL CONDUCTORS

The use of Aluminum for electrical purposes has continually increased during the past five or six years. It possesses properties which make its use desirable in electrical construction and is now being successfully used for High Tension Transmission Wire, Railway Feeders, Bus-Bars, etc.

PUBLICATIONS

The following publications issued by us contain much valuable information for the aluminum user and will be gladly sent to those interested:

PROPERTIES OF ALUMINUM

ALLOYS OF ALUMINUM

METHODS OF WORKING ALUMINUM

FABRICATED ALUMINUM

ALUMINUM FOR ELECTRICAL CONDUCTORS

INSTRUCTIONS FOR INSTALLATION AND MAINTENANCE OF ELECTRICAL CONDUCTORS

THE BAYONNE CASTING COMPANY

General Offices and Works, BAYONNE, N. J.

MONEL METAL, BRASS, BRONZE, ALLOYS

MONEL METAL

[illegible]

[illegible]

[illegible]

[illegible]

MONEL METAL CASTINGS

[illegible]

[illegible]

AMERICAN VULCANIZED FIBRE CO.

Established 1873

P. O. Box No. 920 WILMINGTON, DEL.

SOLE MANUFACTURERS OF ORIGINAL VULCANIZED FIBRE

THE IDEAL MATERIAL IS VULCANIZED FIBRE

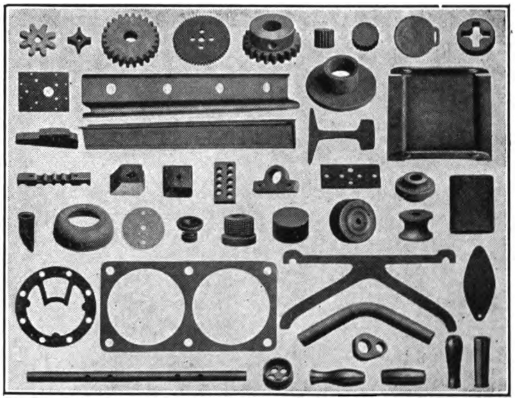
Characteristics: About the consistency of horn; Good Insulator; Great Mechanical Strength; Tough, Tenacious, Pliable, Durable; Improves with Age; Capable of being Sawed, Turned, Bent, Embossed, Drilled, Threaded, Cut, Sheared, Punched, etc., etc.

STRENGTH in lbs. per sq. inch: TENSILE 9,000–14,000; COMPRESSIVE 38,000–42,000; SHEARING 9,000–13,000; SPECIFIC GRAVITY 1.36–1.46; ELECTRICAL RUPTURE 200–400 volts per 1/1000 inch of thickness.

COMPARATIVE TABLE	Pounds per cu. ft.	Effect of Oil, etc.	Effect Rodents, Vermin, etc.	Brittle or Tough	Effect of Age
VULCANIZED FIBRE	85	None	None	Tough	Improves
Porcelain, etc.	144	None	None	Brittle	......
Hard Rubber	150	Deteriorates	......	Brittle	Deteriorates
Rawhide, Leather, etc.	...	Deteriorates	Destroy	Tough	Deteriorates

STOCK SHAPES—SHEETS, RODS, TUBES

To Order—the following:



Adjusters (Cord)
Bars (Switch)
Baskets (Hop)
Baskets (Mill)
Baskets (Waste) "Vul-Cot"
Bases (Switch)
Bearings (Plain, Thrust, etc.)
Bobbins (Coil)
Boxes
Bumpers (Textile)
Bushings
Cans (Roving)
Checks (Factory Time)
Cleats
Conduits (Interior)
Discs (all kinds)
Ferrules (Condenser, Handle)
Frames (Bolster Case)
Frictions
Gaskets (Oilproof)
Gears (Noiseless)
Gear Blanks
Gibs (Engine, Crossheads)
Handles
Heads (Magnet, Bobbin, Spool)
Insulation
Insulators (Rail Joint)
Linings (Clutch) "Auto"
Mirror Backs
Packings
Pinions
Rings
Rods
Rollers
Rolls (Pinking)
Seats (Chair)
Shims (Switch)
Shoe Horns
Shoes (Brake)
Staples (Insulating Saddle)
Straps (Brake)
Switch Bars
Tacks (Insulated Wiring)
Tags
Telephone Cleats
Tie Plates
Trucks (Mill)
Tubes
Valves (Pumps)
Washers (Friction, Thrust, Insulating, Compression, Cock, Pipe Union, Carriage Axle, Car Box)
Wedges (Armature)
Wheels
Wiring Cleats
And many others.

Our Vulcanized Fibre Rail Joint insulations and steel tie shims prevent failure of block signals as well as serve to cushion and prevent looseness of rails.

Vulcanized Fibre Pinions and Gears frequently give longer and more satisfactory service than bronze or steel. They are noiseless and vermin and oil-proof, too.

Send us your problems for solution. Let us devise cheaper, lighter and better parts than those you now use. Our Development Department, composed of Mechanical, Electrical, Physical and Chemical Engineers, is ready to help you.

Quotations and Suggestions gladly furnished.

ENORMOUS STOCKS OF SEASONED MATERIAL INSURE QUALITY AND PROMOTE PROMPT DELIVERY.

CHICAGO FLEXIBLE SHAFT COMPANY

57[illegible] La Salle Ave., CHICAGO

BRANCHES

New York London

GAS OR OIL BURNING FURNACES FOR THE HEAT TREATMENT OF METALS AND METAL PIECES

On the opposite page are described and illustrated three out of over one hundred styles and sizes of Stewart Furnaces.

Stewart Furnaces have been on the market for over twenty years. Newer and more modern types are being added to the line constantly. It is kept thoroughly up to date.

The losses and uncertainties of old methods in heating, hardening, tempering, etc., are eliminated with Stewart Furnaces.

These furnaces are all substantially built to withstand long, hard usage; they are made to operate economically and with certainty as to results.

Many of the largest and most important manufacturers in this country and [illegible] have had Stewart Furnaces installed for many years, and the constant additions they make of new Stewart Furnaces to their equipments is sound evidence that they accomplish everything desired in such equipment.

To anyone interested in this line we will cheerfully send our complete catalogue showing over one hundred styles and sizes. Let us know what work you want furnaces to do and the quantity and we will recommend the equipment best suited to your need.

30 DAYS FREE TRIAL OFFER

So satisfactory have Stewart Furnaces proved in the past that we are glad to ship any of them with the distinct understanding that they may be tried [illegible] days, and if not [illegible] we claim in every respect they can be returned to [illegible] All we ask is that in ordering you tell us the kind of work to be done and the quantity to be handled in a given time.

Send for our complete catalogue showing and describing [illegible] hundred styles and sizes of the famous Stewart Furnaces.

CHICAGO FLEXIBLE SHAFT COMPANY

STEWART No. 10 CYANIDE HARDENING FURNACE

Used extensively by bank-note engravers, makers of engraved plates and transfer rolls, cutters, dies, springs, chains, and numerous other steel parts requiring hard surfaces without great depth of case. May be used for heating other chemical solutions whose fumes are poisonous and injurious to the workmen, as the hood is connected with an outside flue.

The extreme depth of case possible is obtained in 17 to 20 minutes, and an indefinitely longer contact will not add to the case—so do not waste time and fuel in longer treatments. Cyanide may be brought to a hardening heat in about 40 minutes, starting with the furnace cold, and may be kept at this heat indefinitely.

SPECIFICATIONS

Capacity No. 10 pot, 10 inches deep, 8¼ inches diameter (inside measurement).

Gas consumption, about 175 cubic feet per hour.

Price, without blower, $75.00.

Price, with blower, $115.00.

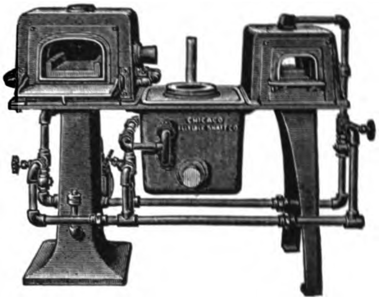
STEWART SPECIAL COMBINATION FURNACE

Oven Furnace, crucible and forge furnace, all combined on one base for economy and convenience. The forge is provided with an opening at the rear, permitting the heating of long bars, and the muffle section may be transformed into an oven furnace by removing the muffle and inserting a slab.

Price, complete, with blower, $125.00. Price, complete, without blower, $100.00

SPECIFICATIONS

Opening of oven section, 4½ in. high in center, 9 in. wide, depth 12 in.
Forge Section, 4 in. high by 5 in. wide by 10 in. deep.
Crucible—Diameter at top, 5 in.; diameter at bottom, 4 in.; depth 11 in.
Number of burners, 10.
Size of gas supply pipe, 1¼ in.
Size of air supply pipe, 1¼ in.
Gas consumption per hour—Crucible section about 70 cu. feet; forge section, about 60 cu. feet; muffle section, about 90 cu. feet.
Forge section will heat high speed steel.
Blowers come separate and are not attached to base.



STEWART No. 3 FORGE

For making small forgings for tool dressing, etc. Required heat is produced quickly. To reach a forging temperature takes but a minute.

SPECIFICATIONS

No. 3 FORGE—

Size of front opening, 3½x8 in.
Rear opening, 3¾ in. in diameter.
Depth, 10 in.
Gas consumption, about 80 cubic feet per hour.
Net weight, 385 lbs.
Shipping weight, 490 lbs.
Shipping case, 24x26x44 in.

No. O FORGE—

Size of front opening, 3½x5 in.
Size of rear opening, 3¾ in. diameter. Depth 7 in.
Gas consumption, about 40 cubic feet per hour.
Net weight, 285 lbs.; shipping weight, 385 lbs.
Measurements of shipping case, 42x28x20 in.
Price, with blower, $55.00; without blower, $30.00.

Complete Catalogue on request.

GENERAL ELECTRIC COMPANY

[illegible] SCHENECTADY, N. Y.

Branch Offices

Nashville, Tenn.
New Haven, Conn.
New Orleans, La.
New York, N. Y.
Omaha, Neb.
Philadelphia, Pa.
Pittsburg, Pa.
Portland, Ore.
Providence, R. I.
Richmond, Va.
Rochester, N. Y.

Salt Lake City, Utah
San Francisco, Cal.
St. Louis, Mo.
Schenectady, N. Y.
Seattle, Wash.
Spokane, Wash.
Springfield, Mass.
Syracuse, N. Y.
Toledo, Ohio
Washington, D. C.
Youngstown, Ohio

[illegible] Company, Ltd., Toronto, Ont.

[illegible] POWER PLANT EQUIPMENTS AND SUPPLIES

[illegible] shown [illegible]

[illegible] APPARATUS

[illegible]

GENERAL ELECTRIC COMPANY

TRANSFORMERS

The Type H transformer for lighting circuits is used by the majority of Central Stations throughout the country. High voltage power transformers are designed especially for reliability under the severest of operating conditions.

LIGHTNING-ARRESTERS

For protecting lines and apparatus the General Electric Company manufactures several different types of lighting-arresters. For D. C. Circuits of different voltages, two types of magnetic blowout arresters are available. Where a very high degree of protection is desired, direct current aluminum arresters are furnished.

For alternating current circuits two different types of multigap arresters give a high degree of perfection for all the lower voltages. The Multigap arrester with graded shunt resistance gives selective paths to ground and has no series resistance so that it freely discharges heavy strokes. It is used for protecting generators and other station apparatus.

The compression chamber multigap arrester is a low priced arrester suitable for protecting pole transformers or other apparatus where the expense of installing the graded shunt resistance arrester is not justified. For all voltages above 6600 the aluminum arrester is recommended as giving the best protection obtainable.

WIRE AND CABLE

The General Electric Company manufactures wires and cables insulated with paper, varnished cambric, rubber or composite (graded) insulation. To meet different conditions of service these cables are furnished with protective coverings of cotton, asbestos, lead, band steel or wire armor.

LAMPS, INCANDESCENT AND ARC

Standard lighting units ranging from a 10 watt Edison Mazda lamp to the flame arc lamp for lighting large areas are carried in stock. Lighting specialists and illuminating engineers of the General Electric Company will assist in laying out any lighting system.

WIRING DEVICES

G-E Reliable wiring devices include panel boards, fuses, switches, terminals, insulators, etc. All these devices are N. E. C. standard.

MOTORS AND CONTROLLERS

For all power installations, complete lines of standard motors including slow speed and back geared types are furnished for either hand or distant control. Automatic starting panels are fast becoming standard for heavy duty motors, or for motors located at a distance. The motor may be started by the push button method or operated automatically by float switches (for constant water levels) or pressure governors (for pressure control). The General Electric Company has a motor for every power application—a controller for every motor, and specialists who can assist in the combined application to obtain best results in the plant.

FLOW METERS

The General Electric Company has developed a practical device for measuring the flow of steam in pipes. The G-E Steam flow meter can be installed in any sized pipe at a small expense, and will give reliable readings of the flow. They are specially useful in the boiler plant and turbine room for measuring the output of the individual boiler and the input of the turbines. G-E Flow Meters are also furnished for measuring the flow of water, air and natural gas.

BULLETINS—FURTHER INFORMATION

Only a few of the products of the General Electric Company are described above. Bulletins, giving information, illustrations and full data on complete electrical apparatus for the power house will be mailed on application from our nearest office.

4094

THE ROBBINS & MEYERS CO.

[illegible] OFFICES, SPRINGFIELD, OHIO

[illegible] and agencies in all important cities

MANUFACTURERS OF ELECTRIC GENERATORS, MOTORS AND FANS

"STANDARD" GENERATORS—Direct Current

[illegible] have been designed with special reference to their use for [illegible]. They are self oiling, and when not used in connection with [illegible] self regulating.

[illegible] the very best material and workmanship, free [illegible] defects, and guaranteed to carry their rated load [illegible] a temperature greater than 40 degrees Centigrade [illegible] surrounding air. They are regularly wound either [illegible] volts direct current, and specially [illegible] charging storage batteries.

[illegible] pulley [illegible] pulleys and the [illegible] bearings.

STEEL FRAMES

[illegible] Frame Generator

Steel Frame Generator

"STANDARD" MOTORS—Direct Current

[illegible] degrees [illegible]

THE ROBBINS & MEYERS CO.

The "Standard" Motors in Small Frames

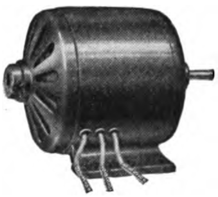
These small Motors are all thoroughly well built of the best materials and by expert workmen. They are of high average efficiency and are fully as durable as the largest size machines. They may be absolutely relied upon for years of satisfactory service.

CAST IRON FRAMES

Frame No.	H. P.	Speed 115 and 230 Volts	Net Weight	Sh'p'g W'ght
1/10	1/30	1000	4 1/2	10
	1/20	1500		
	1/16	2000		
	1/10	3000		
40	1/16	1000	16	20
	1/12	1500		
	1/8	2000		
1/8-B	1/16	1000	25	35
	1/10	1200		
	1/8	1600		
1/7	1/8	1700	18	22
	1/7	2000		
	1/6	2300		
1/7-P	1/16	1000	20	25
	1/10	1500		
	1/8	1800		
	1/6	2400		
1/6-C	1/8	1200	33	42
	1/6	1600		
1/6-D	1/6	1500	35	44
	1/4	2000		

See Bulletin No. 95.

Frame No. 1/8 B.



Frames 42, 43, 54 and 60 with Ventilated End Covers

STEEL FRAMES

Frame No.	H. P.	Speed 115 and 230 Volts	Net Weight without Sliding Base	Shipping Weight
49	1/12	1150	17	40
	1/8	1750		
41	1/8	1150	20	41
	1/6	1750		
54	1/8	900	35	75
	1/6	1150		
	1/4	1750		
43	1/4	900	55	90
	1/3	1150		
	1/2	1750		
42	1/2	800	80	110
	3/4	1150		
	1	1750		
60	3/4	875	130	200
	1	1150		
	1 1/2	1750		

See Bulletin No. 91.

Frame No. 1/10 is the smallest and only frame which may be run on either alternating or direct current, at present supplied. Frame No. 40 is an adaptation of the "Standard" Fan Motor to small power purposes. Frame No. 1/8-B is designed primarily to deliver 1/8 H.P. at 1600 r.p.m. for constant service. Frame No. 1/7 is practically the same size as No. 40, but can meet harder service conditions. Frame No. 1/6-C has the same lines as Frame No. 1/8-B, but delivers the power at a lower rate of speed. Frame No. 1/6-D is intended for heavy intermittent service and is provided with dust-proof covers when required.

Our Lathe and Buffing Motors are described in Special Bulletin No. 79.

The adoption of Steel Motor Frames has resulted in a line of frames unusually compact and light for the output. Binding posts are ordinarily dispensed with, flexible terminals brought out through brushed holes in the body, being used.

Type "P" Alternating Current Induction Motors

The Type P Motors embody many distinct features, being simple in construction, ruggedly built, with heads arranged for floor, wall and ceiling suspension mountings.

TYPE P—SINGLE PHASE
60 Cycles, 110 or 220 Volts

Frame No.	H. P.	Speed	Net Weight	Shipping Weight
14	1/30	1750	15	25
15	1/20	1750	18	28
16	1/10	1750	21	32
17	1/8	1750	27	38
18	1/6	1750	35	50
19	1/4	1750	45	60
14	1/40	1150	15	25
15	1/30	1150	18	28
16	1/20	1150	21	32
17	1/10 or 1/8	1150	27	38
18	1/6	1150	35	50
19	1/4	1150	45	60

Fully described in Bulletin No. 99.

TYPE QP—2 PHASE, TYPE TP—3 PHASE

Frame No	Speed	H. P.	Voltage	Net Weight	Shipping Weight
16	1750	1/8	110–220	21	32
	1150	1/10	110–220	21	32
17	1750	1/6	110–220	27	38
	1150	1/8	110–220	27	38
18	1750	1/4	110–220	35	50
	1150	1/6	110–220	35	50
19	1750	1/2	110–220	45	60
	1150	1/4	110–220	45	60
20	1750	1	110–220	60	85
	1150	1/2	110–220	60	85

This Company also manufactures the "Standard" line of Ceiling, Desk, Bracket, Oscillating Desk, and Exhaust Fans for direct and alternating current, Dynamotors, Motor-Generators, etc.

INGERSOLL-RAND COMPANY

NEW YORK, U.S.A.

[illegible] of the World

[illegible] COMPRESSORS, PNEUMATIC HAMMERS, [illegible] HOISTS, AIR MOTORS, PNEUMATIC [illegible] PUMPS, AIR POWER MACHINERY OF [illegible]

[illegible] DRIVEN COMPRESSORS

[illegible]

Class "NE"

In each type details of design and construction have been carefully worked out to insure the best efficiency, [illegible] and the utmost [illegible]. Capacities [illegible] to 6700 cu. ft. per minute; all pressures up to 3000 lbs.

"Imperial X"

Bulletins No. 3106, 3209, 3311 and 3122.

Every refinement consistent with type and size has been employed to make the largest volume of compressed air per hundred lbs. of steam used — permanent economy being the ideal sought. Capacities in various types, 96 to 8000 cu. ft. per minute; all pressures up to 3000 lbs.

Descriptive Bulletins on Request.

INGERSOLL-RAND COMPANY

"LITTLE DAVID" AND "IMPERIAL" PNEUMATIC HAMMERS

Ingersoll-Rand Hammers for chipping, riveting, caulking, scaling, etc., are made in a complete range of sizes and in two distinct types, meeting every condition. The Company maintains its regular standard in this line, as representative of the quality of the complete Ingersoll-Rand line.

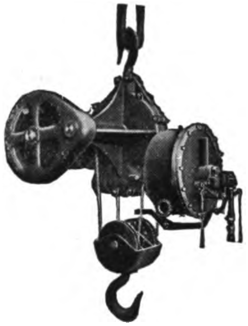
Bulletins No. 8011 and 8103.

"LITTLE DAVID" PNEUMATIC DRILL

This is a new machine, built and sold on the following basis:—It has only two-thirds as many parts as any other drill—does more work per unit of power than any other—requires less attention and costs less for repairs than any other. All standard sizes and types.

Bulletin No. 8107.

"IMPERIAL" AIR MOTOR HOISTS



The hoisting problem—handling work and materials in shop, foundry, warehouse, factory—finds its most economical solution in this silent-running, self-oiling, wholly-enclosed, self-braking hoist. The five sizes have capacities of ½, 1, 2, 3½ and 5 tons, working under ordinary pressures.

Bulletin No. 8006.

"IMPERIAL" AIR MOTORS

(Not Illustrated)

This is a high-grade 3-cylinder wholly-enclosed motor splendidly adapted for running grinders, small tools, small cranes, or other light intermittent service. Two sizes give 2 and 3¼ H. P.

Bulletin No. 8006.

"CROWN" SAND RAMMERS

Experience all over the country has demonstrated that improved castings, larger output, and lower castings cost result from the adoption of "Crown" Pneumatic Rammers in the foundry. And they are built to withstand the hard conditions of foundry service. Both floor and bench types can be had. This machine has also proved useful in ramming concrete in construction work.

Bulletin No. 8308.

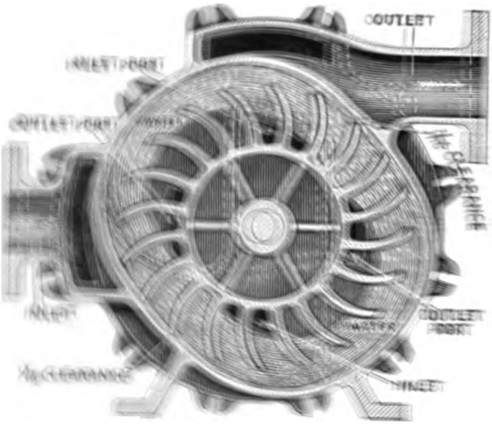
Descriptive Bulletins on Request

[illegible]

NASH ENGINEERING CO.

SOUTH NORWALK, CONN., U. S. A.

NASH HYDRO-TURBINE AIR COMPRESSORS AND VACUUM PUMPS



[illegible]

[illegible] space between [illegible] through [illegible]

[illegible]

[illegible] High Efficiency

[illegible] Without [illegible]

[illegible]

[illegible]

[illegible] VACUUM PUMPS

[illegible]

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NATIONAL-STANDARD COMPANY

NILES, MICHIGAN

MANUFACTURERS OF AUTOMOBILE JACKS, COPPER CABLES, RAILROAD TRACK TOOLS, CATTLE GUARDS AND POSITIVE PRESSURE BLOWERS.

THE DURECO POSITIVE PRESSURE BLOWER

The Dureco Blower is the result of twenty-five years' practical experience in the manufacture of positive pressure blowers. It contains new and original improvements, covered by patents and patents applied for, which make it the most perfect machine of its kind ever offered.

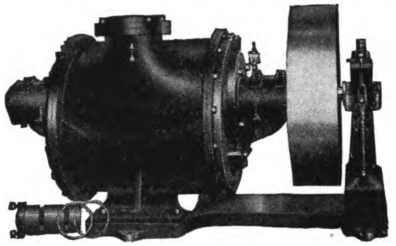
The Dureco Blower is of the impeller type, but is so constructed that there is no friction between the impellers and outer casing, all parts being accurately fitted, so there is a very slight clearance at all times. In efficiency the blower has few equals and no superior. There are no gears, thus the machine operates practically without noise, and being a slow speed blower less power is required to run it than high speed blowers.

In design and construction the Dureco Blower is most simple. It consists of one casing, two heads, one drum with *steel shafts*, three or four vanes, depending upon the size of the blower, and sliding shoes or rollers in each head for supporting the blades of the impellers. The blowers are equipped with bronze ring oiler bearings and in all sizes above No. 1/4 the bearings are adjustable.

These machines will operate successfully under pressure up to 5 lbs. or under dry vacuums of 12 inches. The bearings are so constructed as to form their own packing gland, thus there is no possibility of oil being sucked into the blower when operating under a vacuum, or being blown out when operating under pressure.

Points of Superiority

Requires a minimum amount of power.
Operates successfully at low speed.
Greatest efficiency.
Parts interchangeable.
Adjustable bronze bearings.
Steel Shafts.
Ring oilers.
No gears.
No springs.
Mechanically perfect.
Utmost durability.
Practically noiseless.
Fully guaranteed in every respect.



DURECO No. 1
(Patent Applied For)

SPECIFICATIONS

Size Blower	Dia. of Intake and Outlet Inches	Inside Measurement	Speeds	Cu. ft. free air delivered per minute	Cu. ft. free air delivered per revolution	Size of Pulley	Weight	List Price
000	1	7½ x 3	200 to 400	*18 to 36	.09	8 x 3	75	$40.00
00	1½	7½ x 6¾	300 to 400	39 to 52	.13	8 x 3	105	60.00
0	2	7½ x 9	200 to 400	56 to 112	.28	10 x 3	125	75.00
X	2½	10⅛ x 9	230 to 325	137 to 175	.55	12 x 4	215	110.00
⅛	3	10⅛ x 12	250 to 325	165 to 210	.66	12 x 4	230	140.00
¼	4	12 x 15	175 to 275	210 to 325	1.2	14 x 4	420	200.00
½	6	20 x 14	175 to 225	525 to 675	3	24 x 6	900	300.00
1	8	20 x 20	175 to 225	780 to 990	4.5	24 x 6	1400	400.00
2	10	24 x 25	175 to 200	1300 to 1500	7.5	30 x 8	1900	600.00
3	12	24 x 40	175 to 200	2200 to 2500	12.5	30 x 10	2500	800.00

(*) Capacities are result of tests and can be relied upon.
We will be glad to quote prices and delivery on larger blowers.

NATIONAL BRAKE & ELECTRIC CO.

WORKS AT MILWAUKEE, WIS.

District Sales Offices:

[illegible] Exchange [illegible]

118 Security Bldg.
St. Louis, Mo.

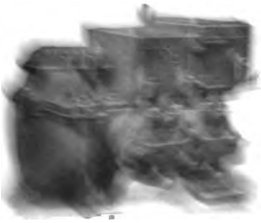
9th and Penn Ave.
Pittsburgh, Pa.

MANUFACTURERS OF NATIONAL AIR COMPRESSORS, BOTH STATIONARY AND PORTABLE, MOTOR, GAS, AND BELT DRIVEN

The National Brake & Electric Co. are the pioneers in the designing and [illegible] compressor units. Its products are designed by [illegible] and are manufactured in shops [illegible] motor driven air compressors.

NATIONAL STATIONARY COMPRESSORS

[illegible] with air brake [illegible] degree of efficiency. [illegible] They have [illegible]



[illegible] MOTOR DRIVEN

[illegible]

[illegible] MOTOR DRIVEN

[illegible]

[illegible] BELT DRIVEN

[illegible]

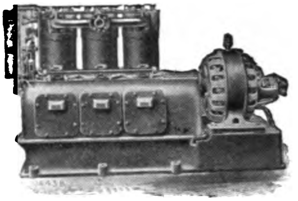
Type "E"—D. C. Compress

[illegible] A. C. Compressor

[illegible]

NATIONAL BRAKE & ELECTRIC CO.

TYPE "3VS"—A. C. AND D. C. MOTOR DRIVEN



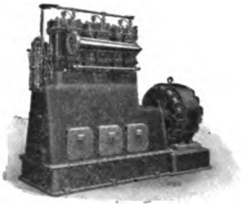
Type "3VS"—A. C. Compressor

The National Type "3VS" Air Compressor has been designed to meet the constantly increasing demand for a self-contained electrically driven air compressor unit.

The air compressors of this type have completely water-jacketed cylinders and cylinder heads; are designed for continuous service, and are built in standard capacities of 50, 100, 150, 225 and 300 cubic feet of free air per minute.

Type "3VS" motor driven compressors are equipped with complete automatic controlling devices, which permit the starting of the direct current compressors with not to exceed one half full load current, and the alternating current compressors with not to exceed full load current. They are also equipped with automatic unloader and automatically controlled water valves. National combined automatic controlling devices for motor driven compressors are absolutely reliable and efficient.

TYPE "3 VD"—A. C. AND D. C. MOTOR DRIVEN

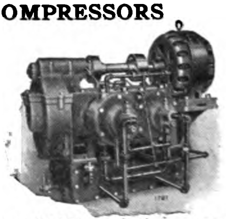


Type "3VD"—A. C. Compressor

This compressor is designed for continuous service and is built in one size only, having a piston displacement of 550 cu. ft. per minute, and is equipped with the same design of combined automatic controlling devices as the "3VS", except being arranged for higher duty.

NATIONAL STATIONARY COMPOUND AIR COMPRESSORS

TYPE "Q-L" AND "Q-E"—A. C. AND D. C. MOTOR DRIVEN



Type "QL"—A. C. Compressor

National Type "Q" Compressors, with capacities ranging from 7 to 70 cubic feet of free air per minute, are intended for service where conditions necessitate the constant delivery of air at high pressures, within the maximum limits, however, of either 200 or 350 pounds. In the latter instance, the compressor, in comparison with that rated at 200 pounds pressure, will have reduced displacement capacity to offset increased pressure.

NATIONAL PORTABLE AIR COMPRESSORS

Type"H"Portable Compressor

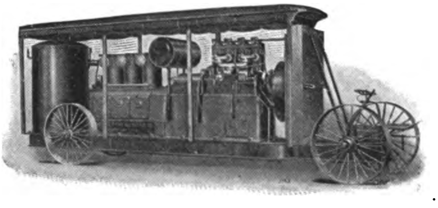
National Portable Air Compressor Outfits are ideally adapted for use in mercantile establishments, mines, quarries, manufacturing plants, and in construction work, where the available floor space is limited, or the nature of the work requires that a supply of compressed air be delivered in different places and under constantly changing conditions.

These portable outfits can be equipped with the same type of motor compressor and controlled in the same manner as any of the National Stationary Compressors previously described.

NATIONAL GAS DRIVEN AIR COMPRESSORS

STATIONARY AND PORTABLE

With the increased adoption of gas motors there has been a constantly increasing demand for "National Air Compressors" driven by gas motors. The same superior features of design that characterize National Type "E" and "3VS" motor driven compressors are embodied in National Type "E" and "3VS" Gas Driven Air Compressors.



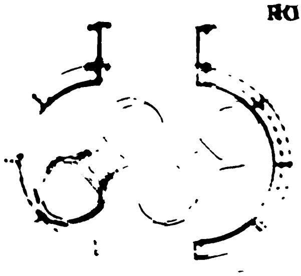
Type "3VS" Gas Driven Portable Compressor

P. H. & F. M. ROOTS COMPANY

CONNERSVILLE, INDIANA

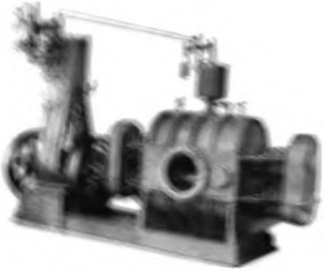
ROTARY BLOWERS, GAS EXHAUSTERS, ROTARY PUMPS, FLEXIBLE ROPE COUPLINGS

ROOTS' BLOWERS



Sectional View Showing Interior Construction

Double Outboard Bearing, Single Geared Smelting Blower with Double Acting Quick Opening Blast Gate



[illegible] Driven Gas Exhauster

FACILITIES

SIZE.—Our facilities are such that we can build Blowers up to sixty-inch gear machines having a displacement of over seven hundred cubic feet per minute.

ACCURACY.—By the use of machines specially made for our work, we insure accuracy which results in high efficiency, [illegible] in all machines.

CAPACITY.—Is the largest of any Positive Blower Company in the world.

SPECIAL MACHINES

We build special machines for handling gases. They can be bronze or lead lined, with or without stuffing boxes. The general construction is the same as Smelting or High Pressure Blowers.

GAS EXHAUSTERS

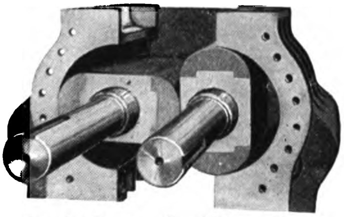
The Roots Exhauster as built today is the nearest approach to a perfect [illegible] throughout, without being cumbersome, work [illegible] sacrificing strength and durability to finish, [illegible] adjustments in places easy of access, without [illegible].

TABLE OF SIZES, POWERS, AND CAPACITIES OF ROOTS' GAS EXHAUSTERS

No. of Exhauster	[illegible]	[illegible]	Speed of Exhauster	Displacement in Cubic Feet per Revolution	Capacity per Hour in Cubic Feet No Allowance for Shrinkage
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	10,920
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	15,720
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	31,380
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	48,900
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	79,680
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	117,900
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	164,640
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	219,900
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	277,200
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	337,920
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	370,580
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	461,700
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	738,000
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,244,400
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1,463,520

P. H. & F. M. ROOTS COMPANY

ROOTS ROTARY PUMPS



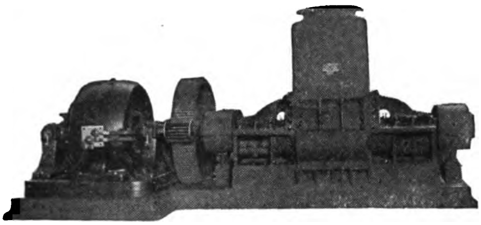
Interior Construction of Rotary Pump

The range of operation of these Pumps is from ten feet to two hundred feet head and for handling any liquid substance, not containing grit, with economy ranging from 75 per cent to 85 per cent of the power applied to the Pump shaft.

The source of power may be turbine, steam or motor, and any of these classes of power may be direct connected, geared or belt driven, thus giving a wide choice of arrangement and allowing the Pump to be used under almost any conditions.

Irrigation reservoir, condenser, cooling towers, circulating work for hot or cold water or brine, are a few among the many purposes to which the Pumps are successfully applied. The sizes range from the 50,000 gallons a minute irrigation pump, running 70 r.p.m., tc the small 1-10 gallon displacement per revolution Pump, running 600 r.p.m.

For handling oil, tar or ammonia, these pumps are well suited. Special lining and impellers may be used where the liquids to be pumped would attack cast iron.



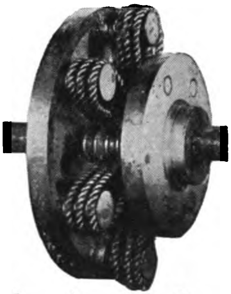
Direct Connected Motor and Pump

Briefly, the operation of the Pumps is as follows: The revolution of the shafts and impellers traps the water between the lobes and the case, delivers it to the discharge side, where the rolling together of the impellers on the center lines of the shaft prevents the return of the water.

The care and workmanship with which the impellers are fitted to each other and to the case assure a small slip of water both at the rolling and case contacts. The suction air chambers cast on the lower half of the half circles save unsightly pipe connections, at the same time stiffening the Pump as a whole.

The flow of water is steady and uniform, and unless air enters the suction pipe, free from pulsation.

FLEXIBLE ROPE COUPLINGS



This coupling was designed to meet a condition in rotary pump work, and proved so satisfactory for this work that it is now used on a large percentage of our direct connected Blowers, Exhausters and Pumps. The points of advantage that place it ahead of other designs for the same purpose are these:

FIRST—It corrects for misalignment in any direction, whether due to settling of foundations, wear of engine bearings, or original setting, thus saving uneven wear and heating.

SECOND—It takes care of end thrust caused by heating, wear of bearings or oscillations of the driving mechanism.

THIRD—It eases up sudden fluctuations of load by the swing of the loop.

FOURTH—It permits rotation in either direction, with equal results and symmetrical positions.

FIFTH—The ropes can be removed as quickly as the bolts in a solid coupling can be taken out.

SIXTH—With ropes off, either the driving or driven machine can be rotated without interference.

SEVENTH—The life of the ropes is long and can be renewed at small expense.

WILBRAHAM-GREEN BLOWER CO.

POTTSTOWN, PA.

MANUFACTURERS OF THE "WILBRAHAM-GREEN" ROTARY POSITIVE PRESSURE BLOWER AND GAS EXHAUSTER. SUITABLE FOR EITHER LOW OR HIGH PRESSURES. HIGH PRESSURE MACHINES ARE, HOWEVER, USUALLY DESIGNED TO SUIT THE PARTICULAR WORK THEY ARE TO PERFORM.

A few of the lines of work for which our Blowers and Gas Exhausters are especially adapted and have been used during the last 40 years: Smelters, Pneumatic Tubes, Oil Burning, Foundry Cupolas, Paper Mills, Vacuum Pumps, Oil Refineries and Gas Works.

The internal construction of Blowers and Gas Exhausters is very similar.

Pulley Driven Blower

Low pressure machines are usually single-geared.

High pressure machines are usually double-geared.

Bearings are bushed with Phosphor Bronze; are Ring Oiling, and very large, so that the pressure per inch square of projected area is extremely low.

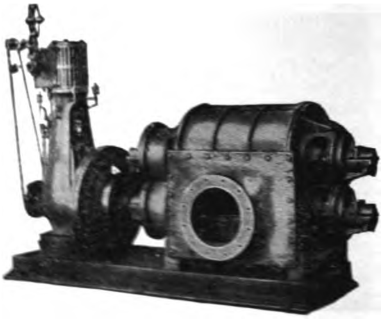
Motor Driven Blower

Shafts are FORGED STEEL.

Our design allows the driving pulley or gear to be placed against the end of the Bearing, reducing the overhang to a minimum. This is a very IMPORTANT feature, in either a Pulley or Motor Driven unit.

Gears are accurately cut from the solid and very wide face.

Blowers or Exhausters are built with pipe connections either top or bottom or on the sides, to suit conditions.



Engine Driven Exhauster

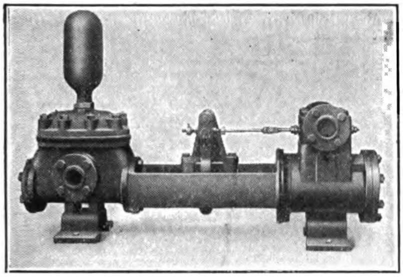
Regular Pulley-Driven Blowers. Approximate Dimensions in Inches

No.	Number of Revolutions (with [illegible])	Total Length	Vertical Blower Side Outlets		Horizontal Blower Top or Bottom Outlets			Pulley		Average Shipping Weight
			Total Height	Face to Face of Flanges	Total Height	Face to Face of Flanges	Total Width	Diameter	Face	
1	[illegible]	52	[illegible]	28	24	25	30	20	5	1,525
2	[illegible]	[illegible]	[illegible]	28	24	25	30	24	6	2,100
3	[illegible]	[illegible]	[illegible]	28	[illegible]	28	36	30	6	2,800
4	[illegible]	[illegible]	[illegible]	29	30	29	41	32	7	3,800
5	[illegible]	[illegible]	[illegible]	34	34	34	46	40	8	4,800
5A	[illegible]	[illegible]	[illegible]	34	35	[illegible]	[illegible]	40	9	5,700
5B	[illegible]	[illegible]	[illegible]	34	36	[illegible]	[illegible]	42	9	6,100
6	[illegible]	[illegible]	[illegible]	[illegible]	40	[illegible]	[illegible]	48	10	7,800
6A	[illegible]	[illegible]	[illegible]	42	45	42	[illegible]	48	10½	9,500
6B	[illegible]	[illegible]	[illegible]	44	45	44	62	48	12	11,400
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	54	[illegible]	
[illegible]	[illegible]	[illegible]	[illegible]	60	[illegible]	62	[illegible]	60		
[illegible]	[illegible]	144	[illegible]	60	[illegible]	62	[illegible]			
8	[illegible]	154	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			

Larger Sizes Built to Order

THE BLAKE & KNOWLES STEAM PUMP WORKS

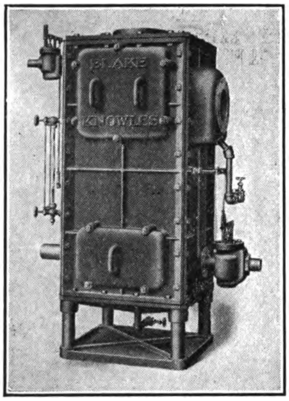
MAIN OFFICE: 115 BROADWAY, NEW YORK
FACTORY: EAST CAMBRIDGE, MASS.

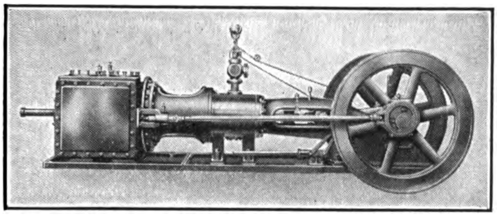


IMPROVED SIMPLEX PUMPS
For Boiler Feeding, Pressure,
Tank and Vacuum Service.
Horizontal and Vertical Patterns

FEED WATER HEATERS

Open and Closed Types



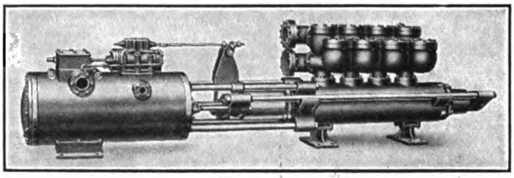


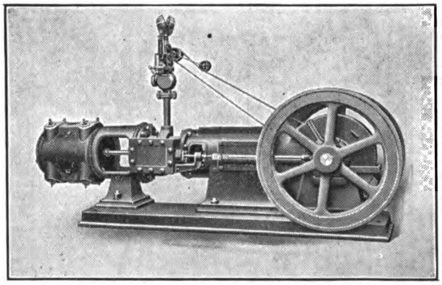
ROTATIVE DRY VACUUM PUMPS

Steam and Power

For High Vacuum Service

SINGLE COMPOUND PLUNGER PUMPS
For Boiler Feeding,
Elevator Service, etc.





CLIMAX ENCLOSED FRAME AIR COMPRESSORS
Single and Duplex: Steam or Power Driven

Branch Offices in all Principal Cities

B244.8

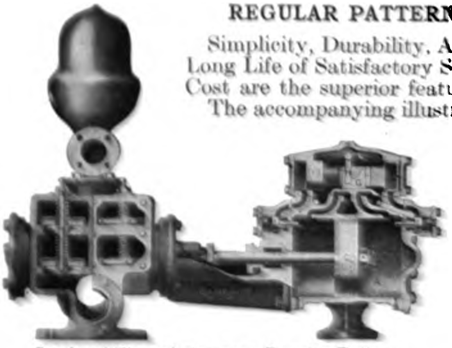
Pumping Machinery

A. S. CAMERON STEAM PUMP WORKS

11 Broadway, NEW YORK

DESIGNERS AND BUILDERS OF SIMPLEX AND COMPOUND, PISTON AND PLUNGER, MARINE, PRESSURE, AIR AND VACUUM STEAM PUMPS; SURFACE AND JET CONDENSERS; CENTRIFUGAL AND TRIPLEX ELECTRIC PUMPS FOR ALL SERVICES

REGULAR PATTERN FOR GENERAL SERVICE


Sectional View of Cameron Regular Pattern

Simplicity, Durability, Absence of Outside Valve Gear, and Long Life of Satisfactory Service at the Lowest Maintenance Cost are the superior features of Cameron Steam Pumps.

The accompanying illustration shows the simple design and compact construction of the Cameron Regular Pattern Pump. It has fewer working parts than any other steam pump.

The Steam Mechanism consists of four stout pieces only, none of them delicate, intricate or exposed to injury. While under full pressure of steam the suction pipe may be lifted out of the water, and the pump allowed to run at full speed with less danger of the piston striking the cylinder heads, than any other pump made.

The Steam Valve Movement works in line with the main piston without the aid of arms or levers. There are no rods or tappet bars to get damaged or cause trouble. For this reason the Cameron can be run at a higher speed, and consequent greater capacity.

The Cameron will not reverse until the full stroke is completed, which insures maximum capacity and reduces wear.

These features, plus excellence of material and workmanship, have gained for the CAMERON a world wide reputation for Efficiency and Economy.

SIZES AND CAPACITIES OF CAMERON REGULAR PATTERN

Size Number	Diameter of Steam Cylinder, Inches	Diameter of Water Cylinder, Inches	Stroke of Piston, Inches	Capacity per Stroke Gallons	Capacity at Ordinary Speed per Minute Gallons	Steam Pipe	Exhaust Pipe	Suction Pipe	Discharge Pipe	Floor Space Inches	Weight
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	32 x [illegible]	136
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	260
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	47 x 13	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	47 x 15	435
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	47 x 15	459
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	51 x 16	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	58 x 17	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	63 x [illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	58 x 18	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	63 x 20	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	64 x [illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	64 x [illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	66 x 24	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	73 x 26	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	81 x 30	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	90 x 37	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	103 x [illegible]	[illegible]

CHICAGO PUMP COMPANY

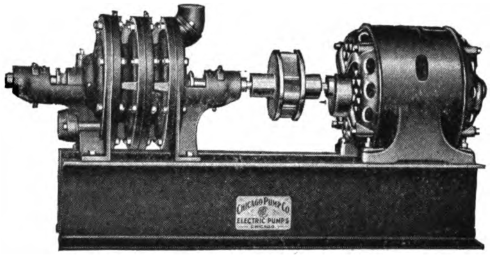
GENERAL OFFICES: 919 W. LAKE ST., CHICAGO, ILL.

MANUFACTURERS OF ELECTRIC PUMPING MACHINERY: DUPLEX ELECTRIC SEWAGE EJECTORS, AUTOMATIC ELECTRIC BILGE PUMPS, LITTLE GIANT ELECTRIC CELLAR DRAINERS, PNEUMATIC WATER SYSTEMS, MULTI-STAGE TURBINE PUMPS, ELECTRIC HOUSE SERVICE PUMPS, AUTOMATIC CONDENSATION PUMPS AND RECEIVERS.

MULTI-STAGE TURBINE PUMPS

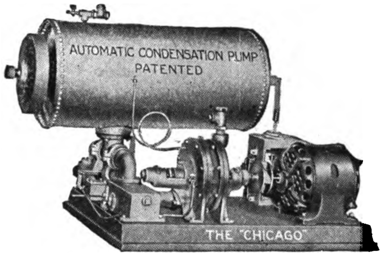
Our line of Multi-Stage Turbine Pumps that are fitted with Outer Board Ring Oiled Bearings and enclosed type balanced Impellers is complete and perfect. Capacities from 10 to 5,000 gallons per minute.

Write for full descriptive catalog.



Multi-Stage Turbine Pump

AUTOMATIC ELECTRIC CONDENSATION PUMPS AND RECEIVERS



Automatic Electric Condensation Pump and Receiver

We illustrate our "Chicago" Condensation Pump which is used for returning water of condensation into Boiler. When a given quantity of water enters tilting receiving tank, it automatically starts motor by closing automatic switch, stopping same when water has been pumped out. There are no floats or any working parts inside this receiving tank. Floats crack, due to great changes in temperature, and are objectionable.

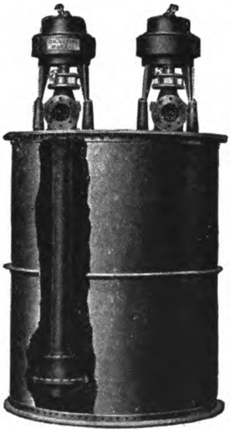
Write for catalog, which fully describes the various types of pumps we manufacture. Our engineers will gladly furnish you with copies of specifications covering any type of pump.

DUPLEX ELECTRIC SEWAGE EJECTORS AND BILGE PUMPS

are built in sizes from 10 to 500 gallons per minute. We have made the scientific construction of Sewage Ejectors our chief study, and these are the results of years of experience and observation. We have eliminated all unnecessary and complicated parts, so that we now have the simplest, most compact and durable Ejector on the market.

Recent Chicago Installations

Westminster Bldg., A. S. Alshuler, Arch.
Crane Co. Bldg., Holabird & Roche, Arch.
Blackstone Hotel, Marshall & Fox, Arch.
Advertising Bldg., W. C. Zimmerman, Arch.
University of Chicago, Shepley, Rutan & Coolidge, Arch.
Joliet Union Station, Jarvis Hunt, Arch.
Beloit College Bldg., Jenney, Mundie & Jensen, Arch.



Duplex Electric Sewage Ejector in Pit

THE DEMING COMPANY

SALEM, OHIO, U. S. A.

New York Office and Stock: [illegible] Chambers Street

SINGLE AND DOUBLE ACTING TRIPLEX PUMPS; ARTESIAN WELL PUMPS AND CYLINDERS, FOR OPERATION BY ELECTRIC MOTORS, GAS OR GASOLINE ENGINES, OR BELT FROM SHAFT.

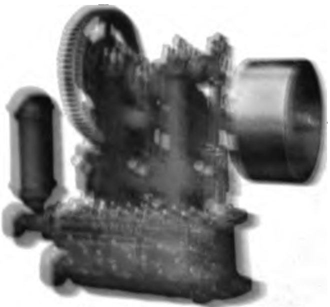


Fig. [illegible], Sizes [illegible] x 8 to 8½ x 8.

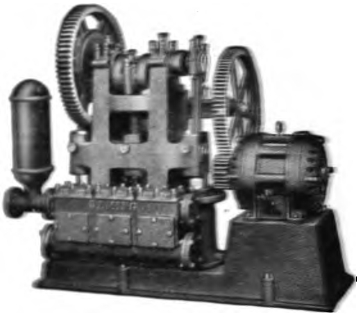


Fig. 30. Size 5¼ x 8 with Type "B" Drive.

[illegible] capacities of 300 gallons to 58,000 gallons [illegible] for Waterworks, Boiler Feeding, General Water Supply, Etc.

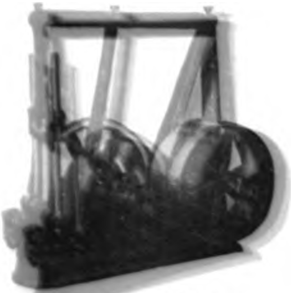


Fig 62, 10-inch Stroke.
Made in three strokes, 10, 16 and 24".
For Wells up to 300 ft. deep.

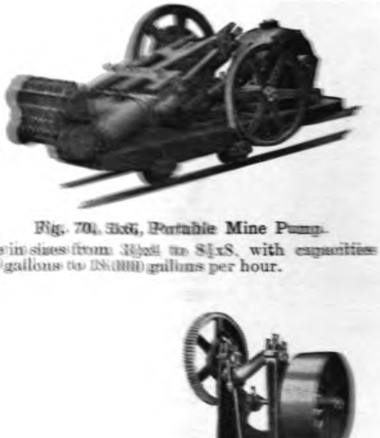
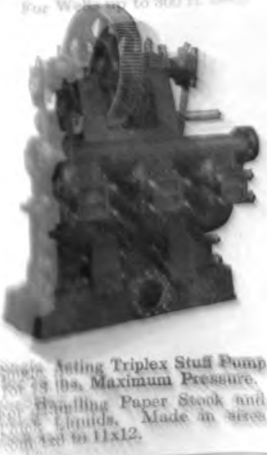


Fig. 70, 3x6, Portable Mine Pump.
Made in sizes from 3½x4 to 8½x8, with capacities of 1,800 gallons to 18,000 gallons per hour.


Single Acting Triplex Stuff Pump for 75 lbs. Maximum Pressure. For Handling Paper Stock and Thick Liquids. Made in sizes [illegible] to 11x12.

Complete
192 Page
Power Pump
Catalogue
Mailed to
Engineers
on Application.

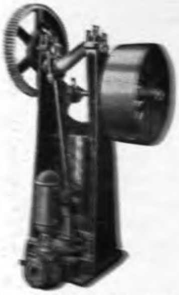


Fig. 80, Deep Well Power Working Head with Differential Plunger.
16" and 24" strokes, capacities 1,000 gallons to 4,500 gallons per hour. For wells 725 ft. deep or less.

Deming Triplex Power Pumps Effect an Actual Saving of 33⅓% over Steam Pumps.

D'OLIER CENTRIFUGAL PUMP AND MACHINE COMPANY

MORRIS BUILDING
PHILADELPHIA, PENNA.

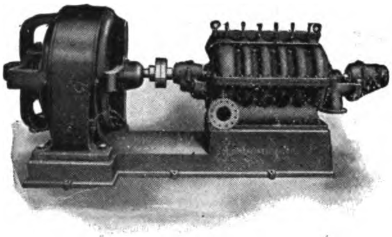
D'OLIER CENTRIFUGAL VOLUTE AND TURBINE PUMPS

FOR WATER WORKS AND IRRIGATION, FIRE SERVICE, BOILER FEED, MINE DRAINAGE, CONDENSER SUPPLY, SEWAGE, FILTRATION SYSTEMS, HYDRAULIC MINING, AND GENERAL SERVICE.

Pumps carefully designed and built for particular service required.

Complete Pumping and Power Plants installed.

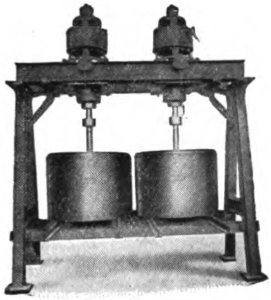
We manufacture only a high grade, high efficiency pump, using the best grade of materials throughout. The impellers are accurately designed and carefully finished, thereby insuring maximum efficiency.



**6"-6 Stage D'Olier Turbine Pump.
700 G. P. M. at 700 ft. total head**

D'OLIER CENTRIFUGAL MACHINES

For sugar, chemicals, sewage, oil and waste, reclaiming, clarifying and filtering and textile work. Belted, electric motor or steam turbine driven. *Special Centrifugals, especially those for extreme High Speeds, designed and built.*



Standard Electric Centrifugals

STANDARD ELECTRIC CENTRIFUGALS

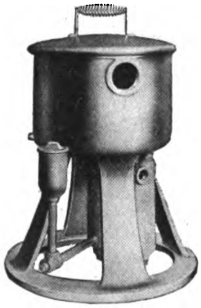
2 in battery on framing, making a self-contained unit. For sugar work, chemicals, etc. A strictly high grade machine of rugged construction; capable of results vastly superior than obtained from the belted or water driven machines formerly used.

D'OLIER COMBINED OIL EXTRACTING AND WASHING CENTRIFUGALS

For separating and reclaiming oil from wiping waste, machinery wiping towels, rags, etc.

Washing and drying waste, towels and other materials.

Recovering oil from automatic machined parts, metal chips, turnings and scrap, and like economic uses.



Combined Oil Extracting and Washing Centrifugal Machine

SEWAGE DISPOSAL PLANTS

UTILIZATION OF WASTE PRODUCTS

Highly efficient apparatus for purification of sewage, drying of sludge and the recovery of by-products.

Screens—Disc, rotating plate and bar and cylinder types.
Centrifugals for purging sludge and screenings.
Pumps for sewage and sludge. *Apparatus for recovery of values.*

Send for Catalogue

W. & B. DOUGLAS

([illegible])

MIDDLETOWN, CONN.

[illegible] John Street

HAND PUMPS, SPRAY PUMPS, POWER PUMPS, BELT, ELECTRIC AND GASOLENE DRIVEN, FOR ALL PURPOSES.

TRIPLEX PUMPS

[illegible] single acting, for water-supply, [illegible] elevator service, sprinkler service, [illegible]

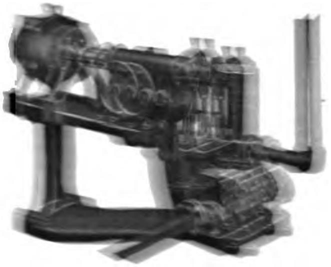
Sizes from [illegible]

Pressures up to 300 lbs. per square inch.

Described in our Bulletin No. [illegible]

ELECTRIC TRIPLEX PUMPS

[illegible]



HORIZONTAL PUMPS

[illegible]

DEEP-WELL PUMPS

[illegible]

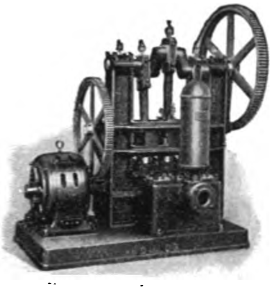
[illegible]

[illegible]

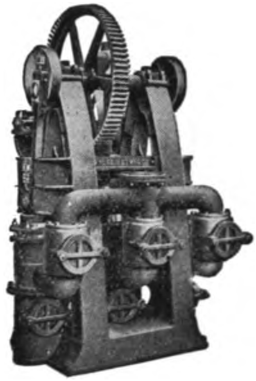
THE GOULDS MANUFACTURING CO.

SENECA FALLS, N. Y.

PUMPS FOR EVERY SERVICE

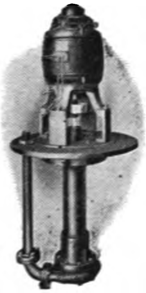


Single-Acting Triplex Pump

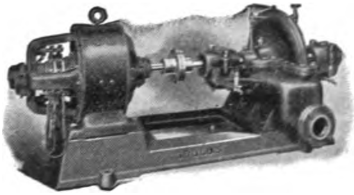


Stuff Pump

Triplex Pressure Pump



Centrifugal Sump Pump

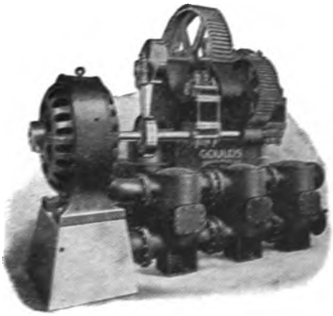


Single-stage, Double-suction Centrifugal Pump

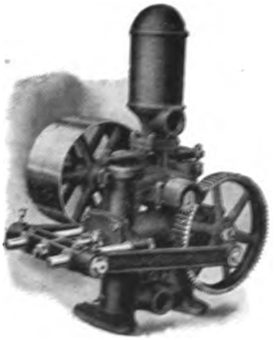
Deep Well Working Head

Ask for bulletins on Power or Hand Pumps for any service in which you are interested.

GOULDS PUMPS



Double-Acting Triplex Pump



Double-Acting Single Cylinder Pump

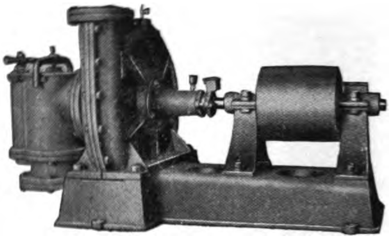
MORRIS MACHINE WORKS

BALDWINSVILLE, N. Y.

CENTRIFUGAL PUMPING MACHINERY, STATIONARY AND MARINE ENGINES AND HYDRAULIC DREDGES.

Morris Centrifugal Pumps are simple in construction: they have only rotary parts, perfectly balanced, no reciprocating parts or valves; require small space and foundation; have high efficiency; are equally suitable for small up to very large capacities, and can handle sand or solids with the water without injury. These pumps direct connected to reciprocating engines are suitable for moderate heads, or direct connected to electric motor or steam turbine (or belt driven) for high heads. For heads above 100 feet, pumps are preferably built in stages.

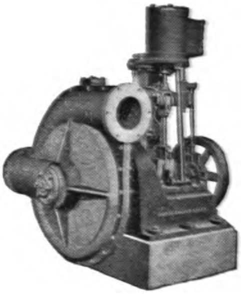
When making inquiries for pumps, full information should be given—that is, quantity of water desired, head, including friction (or give actual elevation and length of suction and discharge piping), type of pump desired, how driven—whether belt, steam engine, electric motor (give electric current characteristics), arrangement of suction and discharge openings desired, whether right hand or left hand, etc.

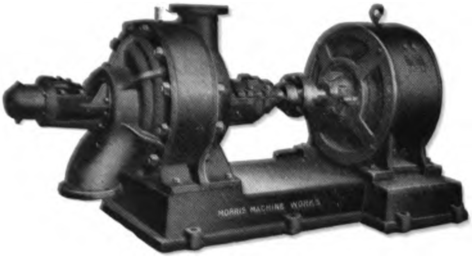


MORRIS IMPROVED STANDARD IRON HORIZONTAL PUMP.

No. Pump (Diameter Discharge Opening)	Size Pipe Flange on Suction, Inches	Economical Capacity, for each Gallons per Minute	Horse-Power Required Pulley, Foot Head	Diameter and Face of Pulley in Inches	Floor Space Required in Inches, Without Primer	Shipping Weight Without Primer, Lbs.	Shipping Weight With Primer, Lbs.	No. Pump
1½	2	70	.058	6 x 6	17 x 31	175	220	1½
1¾	2	90	.075	7 x 8	21 x 32	260	305	1¾
2	3	120	.10	8 x 8	23 x 37	350	415	2
2½	3	180	.15	8 x 8	24 x 38	360	430	2½
3	4	260	.22	8 x 8	25 x 39	415	495	3
4	5	470	.30	10 x 10	29 x 41	615	720	4
5	6	735	.45	12 x 12	34 x 54	940	1075	5
6	8	1050	.59	15 x 12	37 x 55	1180	1345	6
8	10	2000	1 00	20 x 12	45 x 64	2065	2430	8
10	12	3000	1 52	24 x 12	51 x 69	2610	2940	10
12	15	4200	2.00	30 x 14	63 x 71	3615	.....	12
15	18	7000	3.50	40 x 15	77 x 80	7100	.....	15
15	18	7000	3.50	30 x 15	60 x 68	3150	.....	15
18	20	10000	4.50	40 x 16	93 x 103	9000	.....	18
18	20	10000	4.50	30 x 16	66 x 72	4835	.....	18
20	22	12000	5.40	36 x 20	73 x 83	6800	....	20
24	24	15000	6 50	48 x 36	94 x 137	.	....	24

MORRIS MACHINE WORKS

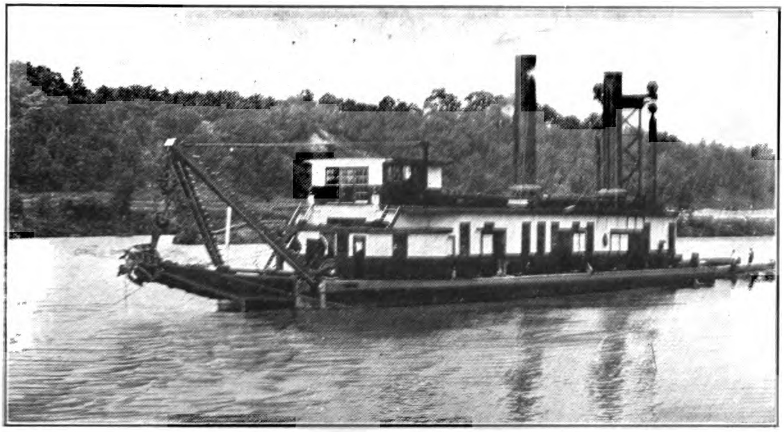




We build CENTRIFUGAL PUMPS for almost any service and of all types, including side suction and double suction, vertical or horizontal shaft. STAGE PUMPS for high heads. TWIN PUMPS for large capacities and high speeds. Or will design SPECIAL PUMPS to suit special conditions. We also build a very complete line of STATIONARY AND MARINE ENGINES, in single cylinder, compound and triple expansion types.

DREDGING PUMPS

MORRIS Dredging Pumps are made in sizes from 2″ discharge and upward, both lined and unlined. They are belt driven or direct connected to steam engines. We can furnish pumps only or the complete dredge, including all machinery.



20″ HYDRAULIC DREDGE with [illegible] **MORRIS** Triple Expansion **Engine, Water Tube Boilers, Cutter Machinery,** [illegible] e Has an Average Capacity of 250,000 Cubic Yards of Material per [illegible]

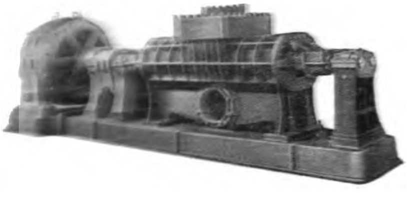
WILLIAM E. QUIMBY, INC.

122 S. Michigan Ave.
Chicago, Ill.

548 West 23rd Street
New York

MANUFACTURERS OF QUIMBY ELECTRIC PUMPS

QUIMBY SCREW PUMPS



2,[illegible] Gallons Per Minute Oil Pump

In the Quimby Screw Pump [illegible] screws mounted in pairs on [illegible] shafts, act as pistons in prope[illegible] the water. There is no end thrust [illegible] screws in their bearings, because [illegible] back pressure of the column [illegible] is delivered to the middle [illegible] cylinder and the end wise pressure upon the screws in one di[illegible] exactly counterbalanced [illegible] pressure in the opposite di[illegible]

Simplicity—These pumps [illegible] internal packing and no small moving parts. The working [illegible] comprised in two moving pieces.

Efficiency—Have a very [illegible] against a wide range of pressure.

No Pulsation and No Hammer—[illegible] the screws on the liquid is continuous and the delivery is [illegible] which cause hammering in pipes.

Maintenance and Durability—[illegible] direct. Have no internal packing that must be frequent[illegible] is perfectly balanced. The absence of rubbing surfaces a[illegible] absence of internal friction gives these pumps great durability.

SIZES: Quimby Screw Pumps [illegible] standard sizes from 30 to 3,000 gallons per minute for maximum [illegible] pounds per square inch and from 30 to 375 gallons per minute [illegible] pressure of 175 pounds per square inch. Larger pumps and pumps [illegible] are built to order.

APPLICATIONS: Electric [illegible]—[illegible] pump, the Quimby Pump is [illegible] owing to the continuous flow [illegible] in a small space. As **House [illegible] Pumps,** the Quimby Pumps [illegible] them being absolutely pulseless [illegible] small repair work required.

QUIMBY S[illegible] BILGE AND SEWAGE PUMPS

[illegible]

[illegible] Sump Pumps are heavily built, always [illegible] automatic and easily accessible [illegible] which carries the impeller and [illegible] at the level of the sump [illegible] being at the pump and [illegible] water.

[illegible] Bilge Pumps are mounted on [illegible] bilge tanks of various sizes [illegible] are the simplest possible pumps [illegible] space, operate automatically [illegible] upon to work when wanted.

[illegible] and Sump Pumps are built in sizes [illegible] gallons per minute.

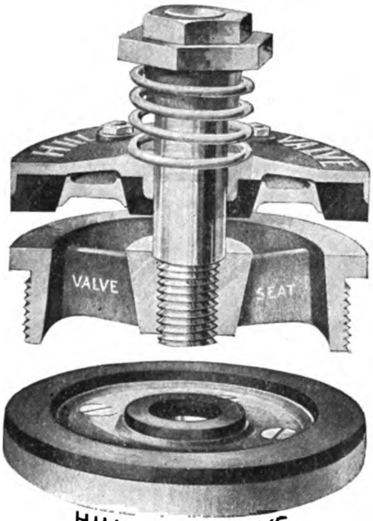
[illegible] Pumps—We have made a study of [illegible] years, having installed sewage [illegible] houses, office buildings and [illegible] pumps to handle sewage should [illegible] signed for that work and we are [illegible] questions and submit estimates.

[illegible] answers in detail the usual [illegible] to send this catalogue or request [illegible] looking for described in this catalogue, but if not, we will help you [illegible]

THE HILL PUMP VALVE CO.

CHICAGO, ILL.

HILL PUMP VALVES FOR BOILER FEED, VACUUM, ELEVATOR AND MINE PUMPS, PUMPING ENGINES, TAR, OIL AND BRINE PUMPS.



HILL PUMP VALVE
PAT. APR. 13-1909

Hill valves remain efficient, always seal tight, wear evenly and cannot ride on the bridges.

Pumps equipped with this type of valve give highest possible efficiency and capacity and continue to do so.

It has been found that the installation of Hill Valves increases a pump's efficiency from 10 to 50%.

Made in all sizes from 2" to 8" diameter.

CONSTRUCTION

The construction of this valve is shown in the cut. The valve consists of a bronze body carrying two composition seal rings, the seal rings being retained in place by the outer and inner lips of the body and by a concentric wedge ring. The body has a central sleeve bearing which fits loosely on the stem. The inner ring does not come in contact with the stem. The binder ring is bronze and is held to the valve body by brass screws and lock nuts. All similar parts of valves of the same size and type are interchangeable.

The valve seat has three ribs except in the larger sizes. The ribs of the seat are not required to support the valve and thus the lesser number increase the area of the waterway, and greatly decrease the friction. The bridges are machined below the seating surface so that the water stands above them even when the valve is on its seat.

The valve stems are Tobin bronze. The upper end is threaded for the spring cap and lock nut. The spring cap is grooved to center the spring.

The spring is made of a superior grade of bronze wire of suitable tension to seat the valve properly.

The lift of the valve is such as to give a free waterway area equal to or slightly in excess of the free waterway area of the seat.

Many pumps have seats which conform sufficiently to the Hill Valve to obviate the necessity of changing seats.

For further information address the Hill Pump Valve Co., Chicago.

R. D. WOOD & COMPANY

PHILADELPHIA, PA.

ENGINEERS, IRON FOUNDERS, MACHINISTS:—WATER AND GAS WORKS APPLIANCES, AND PUMPING MACHINERY; CAST IRON PIPE; GAS HOLDERS, PURIFIERS, CONDENSERS, COAL GAS PLANTS; HYDRAULIC TOOLS AND MACHINERY, PUMPING ENGINES, CENTRIFUGAL PUMPS; GAS PRODUCERS, GAS PRODUCER PLANTS FOR POWER, FUEL AND METALLURGICAL PURPOSES, THEISEN WASHERS; GENERAL MACHINERY, LARGE LOAM CASTINGS; SUGAR HOUSE APPARATUS; VALVES AND HYDRANTS.

CAST IRON PIPE

Bell and Spigot Pipe from [illegible] inch to 84 inches in diameter. Flange, Special deep Bell, High Pressure, Flexible joint, or Submarine Work. Standard and Special Fittings. Heavy Loam and Dry Sand Castings.

PUMPING ENGINES

Vertical Triple Expansion, and Direct Acting for Water Works, Sewage, [illegible] pumping engines of both the [illegible] Designed to combine highest [illegible] and utmost simplicity.

[illegible] preliminary [illegible] furnished upon application [illegible] specifications [illegible]

CENTRIFUGAL PUMPS

[illegible] Systems, Irrigation, Reclamation, [illegible]

[illegible]

Gas Holders—Single or Multiple Lift— [illegible]

[illegible] Works.

[illegible] Purifiers, Condensers, Gas [illegible]

[illegible]

[illegible]

[illegible] Steel Tanks

[illegible]

R. D. WOOD & COMPANY

HYDRAULIC MACHINERY

Hydraulic Presses of every description for the heaviest work, Steam Hydraulic Forging Presses, Punches, Shears, Riveters, Intensifiers, Hoists, Pressure Pumps, Cranes, Valves, etc., etc. For the majority of operations to which hydraulic power can be applied, and especially those requiring very great force exerted through a comparatively short stroke, as in riveting, punching, shearing, lifting, forging and flanging, there is no other system at all comparable with it for efficiency, uniformity, simplicity or economy. This is true for several reasons; primarily in that there is absolutely no motion or power consumed except in the act and at the moment of performing the desired operation.

HYDRAULIC VALVES

Hydraulic Operating Valves, Check, Foot, Stop and Shock Relief Valves

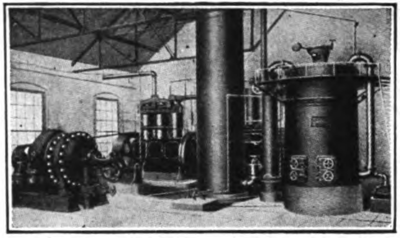
A high grade valve is an essential to the satisfactory operation of hydraulic machinery.

We are building a patented type of operating valve which is giving excellent service. We have also a special line of Check, Foot, Stop and Shock Relief Valves.

PRODUCER GAS PLANTS

We have had years of experience in the building of producers for all kinds of fuel purposes as well as for power, and our customers may be certain of securing apparatus suitable to their requirements both from an economic and operating standpoint.

Our engineering department is at your service, and we would be pleased to have our representative visit your plant and give full details.



GAS WASHERS

We control for the United States the Theisen Gas Washing Process, which we build for producer and blast furnace gas. This Process was adopted by the United States Steel Company at Gary, and is being put in with all their new construction. It delivers the gas to an engine cleaner than the air in the mixture.

GENERAL MACHINERY

Our shops are well equipped for building large machinery of every description, such as sugar, chemical and similar work.

IRON CASTINGS

We are especially well equipped for making large and intricate loam castings; also castings in dry sand and green sand.

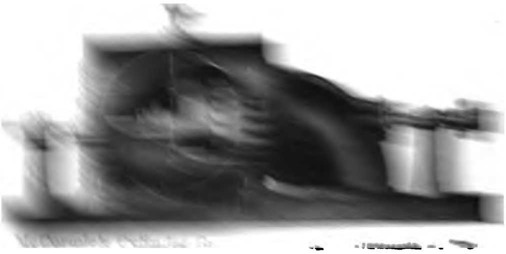
HYDRANTS AND VALVES

Fire Hydrants, Mathews patents for standard and high pressure. Gate, Check, Foot and Air Valves, Valve Boxes, Indicator Posts, Foot Valve and Intake Screens, Hood Racks, etc.

J. & W. JOLLY

HOLYOKE, MASS., U. S. A.

HORIZONTAL AND VERTICAL TURBINES



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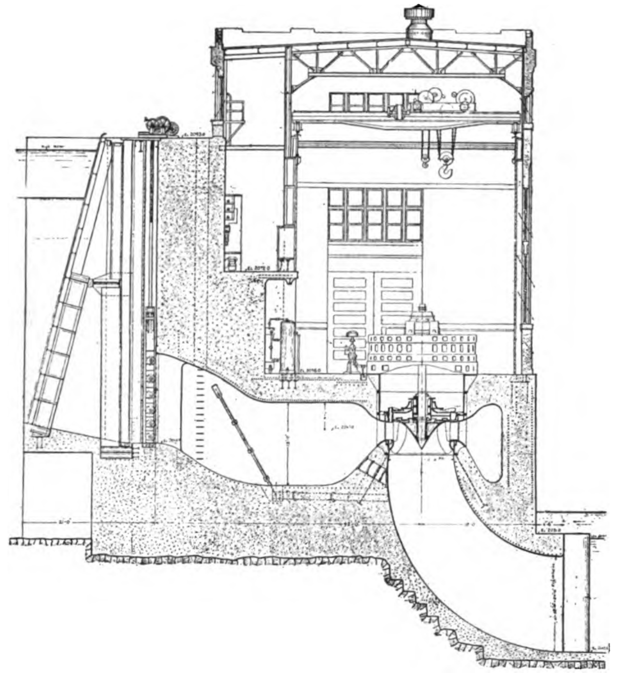
I. P. MORRIS COMPANY

HYDRAULIC DEPARTMENT

PHILADELPHIA, PA.

SPECIALISTS IN THE DESIGN AND CONSTRUCTION OF HIGH CLASS, HIGH POWER AND HIGH EFFICIENCY HYDRAULIC TURBINES.



Cross section through one 6,000 horse-power turbine in Development No. 2 Power House, Appalachian Power Company, Virginia. Total equipment furnished this Company consists of seven turbines with I. P. Morris governors. Careful efficiency tests made by the Consulting Engineers of the Power Company, Messrs. Viele, Blackwell & Buck, show the average of the maximum efficiencies of two of the units to be 93.7%, clearly indicating the advisability of using the single runner, vertical shaft turbine for low heads.

Among the contracts for turbines of this type recently awarded to the I. P. Morris Company may be mentioned:

Appalachian Power Company, **New River, Va.**	Station No. 2. 4—6,000 H.P. Turbines Head 49 feet, Speed 116 R.P.M. Station No. 4. 3—3,500 H.P Turbines Head 34 feet, Speed 95 R.P.M.
Mississippi River Power Company, **Keokuk, Iowa**	8—10,000 H.P Turbines Head 32 feet, Speed 57.7 R.P.M.
J. G. White & Co., **Stevens Creek Development, Georgia**	5—3,125 H.P. Turbines Head 27 feet, Speed 75 R.P.M.
Alabama Power Company, **Coosa River, Alabama**	4—17,500 H.P. Turbines Head 68 feet, Speed 100 R.P.M.
Cedar Rapids Mfg. & Pr. Co., **St. Lawrence River, Canada**	9—10,800 H.P. Turbines Head 30 feet, Speed 55.6 R.P.M. 3—1,500 H.P. Turbines Head 30 feet, Speed 150 R.P.M.
Laurentide Company, Ltd., **Grand Mere, P. Q., Canada**	6—20,000 H.P. Turbines Head 76 feet, Speed 120 R.P.M.
Northern Ontario Light & Power Co., **Fountain Falls, Cobalt, Canada**	2—1,500 H.P. Turbines Head 30 feet, Speed 150 R.P.M.

Total capacity of turbines built or under construction by I. P. Morris Company, 1,586,735 horse-power, of which turbines aggregating 711,735 horse-power were contracted for during the last eighteen months.

AMERICAN PROCESS COMPANY

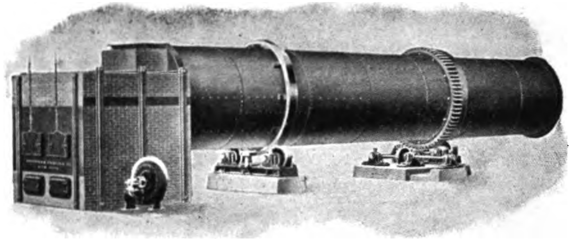
68 William Street, NEW YORK

MANUFACTURERS OF DRYERS, PRESSES, DIGESTERS, COOKERS AND SPECIAL MACHINERY; COMPLETE PLANTS DESIGNED AND EQUIPPED

AMERICAN PROCESS MACHINERY

The distinguishing features of all the machinery introduced by the American Process Company and which puts it in a class by itself, is its automatism, continuity and uniformity of action. With an American Process machine the product is absolutely uniform, labor is reduced to practically nothing, and as the machine is not subject to the wear and tear of starting, stopping and reversing or otherwise changing the load, its life easily outlasts any similar type.

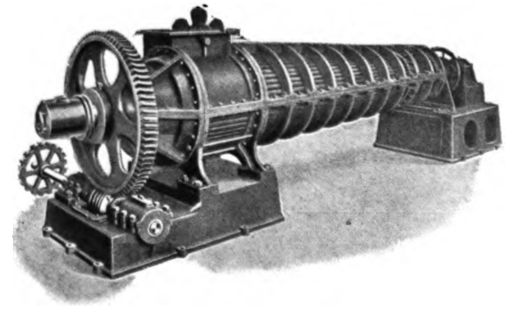
DIRECT HEAT ROTARY BLAST DRYER



The American Process Direct Heat Dryer is of the direct heat and direct contact type. It consists essentially of a cylindrical steel shell, provided on the interior with longitudinal shelves. Near each end of shell is a weldless rolled steel tire which rests on carefully chilled and ground friction roller wheels. These wheels are rotated by gearing or chain belting, and they in turn impart rotation to the shell. The Dryer as a whole is set on a gentle slope, determined and fixed by experience.

Operation—The wet material and the furnace gases enter the shell at the higher end. The wet material falls to the bottom of the Dryer, is caught by a shelf, elevated to almost the highest point of the rotation, and is then showered through the furnace gases. This cycle of operations is repeated until the material, in a dried condition, is discharged from the lower end of the Dryer. The material and furnace gases travel in the same direction with the highest temperature in contact with the wettest material.

AUTOMATIC CONTINUOUS SCREW PRESS



The American Process Press is of a continuous screw type and consists of a horizontal tapered screw built up on a hollow, perforated shaft arranged so as to allow of admitting steam to the material if desired. The screw fits closely inside of a similarly tapered, slatted curb and rotates. The gradual decrease in size of the screw and its curb causes the pressure.

Operation—From a hopper or chute the material enters the feeder, is mechanically measured, and forced into the straight, purely conveyor portion of the screw. The screw carries it into the tapered curb and it is slowly and positively pressed. The material is continually fed in at one end and discharged at the other. The liquids are forced out between the slats, and into drainage holes of shaft and are conducted to a tank.

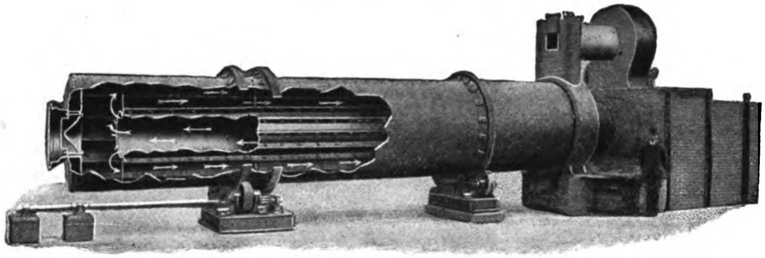
The American Process Company manufactures special Direct Heat and Steam Heated Air Dryers, Coolers, Digesters, Presses and Condensers, of various sizes, to meet any and all conditions. Let them know your requirements and they will advise you what they recommend for your purpose.

RUGGLES-COLES ENGINEERING CO.

McCORMICK BLDG.
CHICAGO

50 CHURCH STREET
NEW YORK CITY

BUILDERS OF RUGGLES-COLES "DOUBLE SHELL" DRYERS, CONSULTING AND CONTRACTING ENGINEERS, DESIGNERS AND BUILDERS OF SPECIAL MACHINERY.



Section of Ruggles-Coles Dryer Showing Direction of Gases

RUGGLES-COLES "Double Shell" DRYERS

We build Ruggles-Coles "Double-Shell" Dryers for drying a large variety of inorganic and organic materials. For this work we have perfected six regular types of dryers, but for certain substances we build special dryers to order. After fourteen years' successful experience we know that the Ruggles-Coles Dryer is designed on the correct principle and point to more than 350 satisfactory installations in all parts of the world as evidence of its superiority.

Class "A" Dryer.—The principle of the Ruggles-Coles "Double-Shell" Dryer is that the material being dried passes the hot gases in the opposite direction to their travel. The Class "A" dryer consists of two concentric shells rigidly connected at the center. Between this point and each end are two sets of swinging arms allowing for unavoidable expansions and contractions. The inner cylinder at the head or feed end is connected with the furnace by a flue lined with fire brick. At the discharge end is a revolving head on the inside of which are lifting buckets, so that the material is delivered out through the central casting. The machine has sixteen bearings, thus distributing the load and eliminating danger of hot journals. The furnace is independent of the machine and located in a convenient place, although generally placed close to the head of the dryer.

The heated air passes through the inner cylinder and returns between the outer and inner cylinders to the fan, passing on the way the material to be dried. By reason of the inclination and revolution of the dryer the material is carried to the discharge end. This dryer is especially suitable for drying cement rock, clay, coal, ores, sand, gypsum, fullers earth, peat, sewage sludge, tankage, etc., etc.

Class "B" Dryer.—For materials which cannot be dried by direct heat on account of the danger from ignition or injury of the materials by furnace gases, we build a dryer similar in all respects to the Class "A" machine except the gases are taken from the inner flue and returned through a number of tubes, so that it does not come into direct contact with the material being dried.

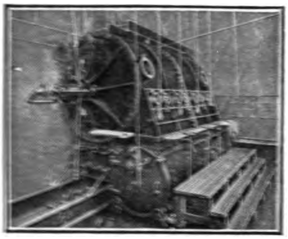
Class "E" Dryer.—For drying nitrate of soda and other fusible salts which are not injured by direct heat but which cannot be dried in a rotary dryer, on account of the material adhering to the shell, we build a special dryer which has the advantage of direct heat with positive feed and delivery.

Class "F" Dryer.—When the quantity of material to be dried is small or the amount of moisture to be evaporated is light, we build a dryer of single shell construction, and while not as economical in fuel cost as our Class "A" dryer is much lower in first cost.

J. P. DEVINE COMPANY

BUFFALO, N. Y.

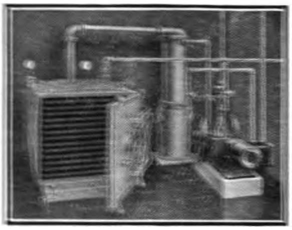
MANUFACTURERS OF VACUUM DRYING & EVAPORATING APPARATUS



VACUUM DRUM DRYERS for Dyewood and Tanning Extracts, Milk and Food Products, Pastes, etc.

A rapid and uniform drying is effected because the drum dips into the solution and takes up a thin film of the wet material of 1-125 of an inch and less. The water is evaporated from the material at a temperature of from 115° F to 95° F, according to the Vacuum in the apparatus of 26½" to 28½".

The drying process is continuous and independent of climatic conditions; free from dust and consequent elimination of danger to health of employees and destruction of property; and at a minimum cost of operation, including labor.



VACUUM CHAMBER DRYERS for Colors, Dyes, Extracts, Salts, Rubber, Smokeless Powder and High Explosives, and other Chemical and Food Products.

The Vacuum Drying Chamber is designed to remove the water rapidly and at a low temperature from materials which cannot be dried by methods used heretofore without altering their chemical composition on account of their sensitiveness to heat. It may also be used with great saving in time, fuel, cost of plant, and working expenses for other substances where a low temperature is not an absolute necessity.

Materials which are difficult to dry in the atmosphere or which cannot be dried at all in the atmosphere without decomposition have all moisture removed from them in a very short time in the vacuum chamber without danger of impairing their qualities by overheating.

VACUUM ROTARY DRYERS, for Starch, Granular Substances, and Chemical By-Products.

The moist material is conveyed by an elevator into a hopper high above the manhole to facilitate the charging of the apparatus. After charging, the manhole is closed and a high vacuum produced by means of an air pump, the vapors passing into the condenser.

Concentric with the steam jacketed outside cylinder is a revolving inside drum, heated by live or exhaust steam, to which stirring blades are attached. The material to be dried is between the inside drum and the outside cylinder and is kept in constant motion by the stirring blades. Thus every particle comes into close contact periodically with the heating surfaces, and a very thorough and even drying process results.

VACUUM PUMPS of highest efficiency and of non-corrosive metals.

VACUUM PANS for any requirement and capacity in single or multiple effect.

CONDENSERS, ETC.

OVER 3,000 INSTALLATIONS IN DAILY OPERATION.

PENNSYLVANIA CRUSHER CO.

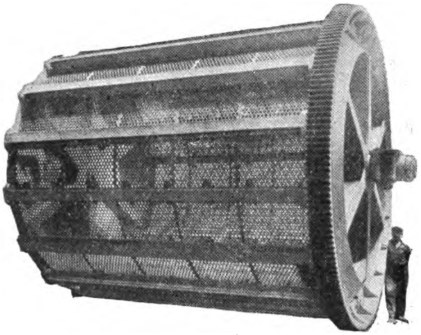
Stephen Girard Bld'g, PHILADELPHIA, PA.

New York, 50 Church Street. Pittsburgh, Machesney Bld'g.

COAL CRUSHING & CLEANING MACHINERY FOR BY-PRODUCT COKE PLANTS, SWING-HAMMER CRUSHERS, BRADFORD COAL CLEANERS, ROTARY AND JAW CRUSHERS, SINGLE ROLL CRUSHERS, GRINDING PANS, DELAMATER "SINK & FLOAT" TESTERS.

"PENNSYLVANIA" BRADFORD COAL CLEANERS

For Power Houses and By-Product Coke Plants



(Pat. applied for)
Bradford Coal Cleaner

In addition to its distinct advantages as a Crusher, this machine has the remarkable ability to *automatically* remove impurities such as slate, bone, sulphur balls or binder from bituminous steam and coking coals, thereby reducing the objectionable ash and sulphur.

It is used extensively in preparing R.O.M.coals in By-Product Coking plants and for Bee-Hive Ovens.

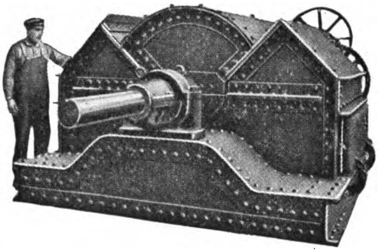
In connection with its crushing and cleaning functions for R.O.M. coal for *large Power Houses*, the "Pennsylvania" Bradford is most efficient in removing stray iron, coupling pins, mine props and all sorts of impedimenta that damage Conveyors, Stokers and other Power House machinery.

For Stoker feed it crushes R.O.M. *with less fines than Rolls or any other type*.

Absolutely automatic in operation, low horse power, runs 12 to 15 R.P.M., requires no labor to operate, other than occasional oiling. Is practically "fool-proof."

The "Pennsylvania" Bradford has also met with much success in connection with Coal Washer plants.

"PENNSYLVANIA" SWING-HAMMER CRUSHERS

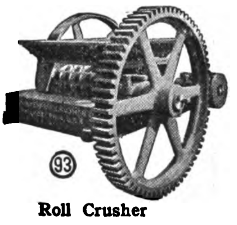


(Patented)
Hammer Crushers

Extensively used for pulverizing Bituminous Coals in By-Product and Bee-Hive Coking Plants, for crushing Cement Rocks and Limestones in Cement Mills, for Lime, Shales, Bone and a multitude of other materials.

Main frame of fabricated Steel practically immune from breakage. Removable Steel Wear Liners, Ball & Socket Bearings, 6, 8 and 10 rows of Hammers, large diameter Steel Discs, quick adjustable Grinding Cage. Built in Capacities 3 tons to 400 tons hourly. By weight the "Pennsylvania" is more than 90% Steel.

"PENNSYLVANIA" SINGLE ROLL CRUSHERS



Roll Crusher

Will take large pieces of Coal, Coke, Iron Ore, Limestone, Phosphate, Gypsum, Flint Clay and reduce to one inch and finer in one operation. A good machine for crushing coal for Stokers.

A single roll revolving close to a quickly adjustable breaker plate, in place of two rolls commonly used. Roll is heavily back geared and rigidly held in its bearings to *prevent spreading when feeding large lumps*. No automatic Feeder necessary. This design is smoother running than the double Roll.

Bed frame in one piece and very rigid. Cut shows rear panel removed, exposing roll. Different designs of roll teeth are made. Moderate H. P., slow speed.

WILLIAMS PATENT CRUSHER AND PULVERIZER CO.

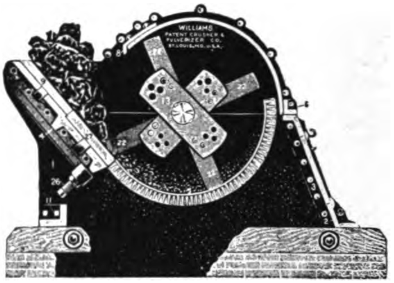
OLD COLONY BLDG. CHICAGO.

WORKS
St. Louis

BRANCH OFFICES
New York San Francisco Philadelphia Pittsburgh

CRUSHING AND GRINDING MACHINERY

COAL CRUSHERS FOR COKE OVEN WORK, BY-PRODUCT AND BEEHIVE OVENS.



By the use of the Williams Patent Hammer Crushers with the various adjustable features, the following results are obtained from the ovens: The oven pulls easier, more coke is made from each oven, the ash is reduced, the coke comes out firm, regular in size, does not crumble, and the structure is much improved.

The substantial construction of these machines is plainly shown in this cut; all parts subject to wear are easily adjustable, which includes the hammers, the discs, the cage bars, and the breaker plates. The housing is entirely protected from wear by heavy liner plates made of heavy chilled iron. The machine is very accessible, as it is made of sectional construction.

Specifications Regular Crusher

Size Mill	Hopper Opening	Size Feed	Capacity Tons Per Hour			Speed	Size Pulley		Extreme Dimensions			Horse Power	W'ght
	In.		½" & finer	¼" & finer	⅛" & finer	R.P.M.	Diam.	Face	L'gth	Wdth	H'ght		P'nds
1	15x12	Run of Mine	30– 4	25 3	20– 25	1000	20"	15"	6'	6'6"	3'9"	20–25	6500
2	20x12		45– 55	40– 50	30– 40	1000	20"	15"	6'	7'6"	3'9"	30–35	7500
3	30x16		65– 80	60– 70	45– 60	1000	20"	15"	6'	8'6"	3'9"	50–60	9500
4	40x18		100–115	80– 90	60– 80	1000	24"	18"	6'	9'0"	3'9"	75–80	10500
5	50x20		120–140	100–110	75–100	1000	24"	20"	6'	9'6"	3'9"	100	12000
6	60x20		150–175	115–130	100–120	1000	24"	22"	6'	11'0"	3'9"	125	13500
					Jumbo Specifications								
5	30x24	R.O.M.	150–175	120–14	80–100	750	24"	18"	8'10"	9'	5'4"	85–100	20000
6	36x24		180–200	145–165	120–140	750	30"	20"	8'10"	10'	5'4"	140–150	24000
7	48x30		225–250	200–220	150–175	750	30"	24"	8'10"	11'	5'4"	165–185	28000
8	60x30		275–300	250–275	180–200	750	30"	24"	8'10"	13'	5'4"	200–250	30000

CRUSHERS FOR ANTHRACITE MINE REFUSE

Our Patent Hinged Hammer Debris Crushers are in extensive use for properly crushing and treating Anthracite debris or Culm before flushing it into the mines.

Specifications Debris Crushers

Size Mill	Hopper Opening	Size Feed	Capacity Tons Per Hour			Speed	Size Pulley		Extreme Dimensions			Horse Power	W'ght
	In.		¾" & finer	½" & finer	¼" & finer	R.P.M.	Diam.	Face	L'gth	Wdth	H'ght		P'nds
1	15x12	Run of Mine	30	20	15	1000	20"	15"	6'	6'6"	3'9"	20–25	6500
2	20x12		40	35	25	1000	20"	15"	6'	7'6"	3'9"	25–30	7500
3	30x16		65	50	35	1000	20"	15"	6'	8'6"	3'9"	40–50	9500
4	40x18		80	70	60	1000	24"	18"	6'	9'0"	3'9"	75–80	10500
5	50x20		115	85–100	75	1000	24"	20"	6'	9'6"	3'9"	100	12000
6	60x20		130	110–125	90–100	1000	24"	22"	6'	11'0"	3'9"	125	13500

We also crush Coal and Pitch for Briquette Plants—for Coal Washers, before and after washing, and make a specialty of sizing Coal for all Commercial Purposes.

WILLIAMS PATENT CRUSHER AND PULVERIZER CO.

CRUSHERS FOR CHAIN GRATES OR STOKERS

The Williams Patent Coal Splitter takes Run of Mine Coal and reduces the same to 1½″, 1¼″, 1″, ¾″ and finer with the "*minimum amount of fine dust,*" the *only* machine made that can be *regulated* to properly *size coal.* All parts are *adjustable* to *wear;* the crusher is also *adjustable* to give most *any* size coal *desired.*

Brief Specifications

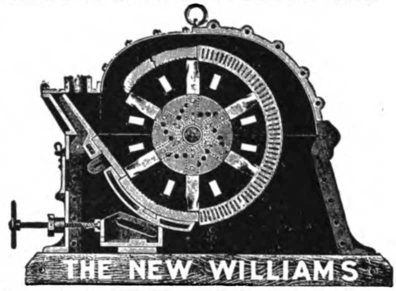
No. of Crusher	Hopper Opening, Inches	Weight	Horse Power	Capacity—Tons Per Hour R.O.M. to 1½″ and Finer
1	15 x 12	6,500	15 to 20	25 to 40
2	20 x 12	7,200	20 to 25	50 to 60
3	30 x 16	9,500	40 to 50	75 to 100
4	40 x 18	10,500	60 to 75	100 to 125
5	50 x 20	12,000	85 to 100	135 to 175
6	60 x 20	13,500	100 to 125	180 to 220
7	48 x 36	22,000	135 to 175	250 to 275
8	60 x 36	30,000	200 to 250	300 to 375
9	60 x 40	40,000	275 to 350	400 to 500

WRITE FOR COMPLETE COAL CATALOG No. 30.

RAW MATERIAL GRINDERS FOR CEMENT AND GYPSUM PLANTS

UNIVERSAL MILL

This *Universal Grinder* is the *only* machine of its kind made. Will take DRY 2″ Limestone, Shale, Clay, or Coal, and deliver at one operation a product 95% through 20 mesh, TUBE MILL FEED WITHOUT OUTSIDE SCREENS OR SEPARATORS. *No other* machine can deliver the fine uniform product year in and out.



Complete Specifications Universal Mills

Size Mill	Size Feed	Diam Mill	Capacity Per Hour Dry Stone Tons		Speed	Horse Power	Floor Space Extreme Dimensions			Size Pulley		W'ght
			12 Mesh	20 Mesh	R.P.M.		L'gth	Width	Height	Face	Diam.	P'nds
0	1 ″	18″	¾	½	1800	10– 12	5′	5′ 1″	3′2″	8½″	8″	2500
1	1½″	26″	2– 4	1– 3	1600	15– 20	6′3″	5′10″	3′8″	10½″	16″	4000
2	1½″	26″	5– 6	3– 5	1600	20– 25	6′3″	6′ 3″	3′8″	12½″	16″	5000
2xx	2 ″	26″	6– 8	5– 6	1600	30– 35	6′3″	7′	3′8″	15 ″	20″	6500
3	2 ″	40″	10–12	8–10	1100	50– 60	7′6″	6′10″	5′4″	15 ″	20″	12000
4	2½″	40″	13–15	10–13	1100	65– 75	7′6″	7′10″	5′4″	18 ″	20″	14000
5	2½″	40″	16–20	15–18	1100	80–100	7′6″	8′ 6″	5′4″	20 ″	20″	16500
9	3 ″	60″	25–35	20–30	750	150–175	12′	9′ 2″	7′2″	24 ″	30″	30000

VULCANITE RE-CRUSHER

These Vulcanite grinders will take raw material, limestone, shale, clay or coal, in cubes of 3 inches and under, and reduce the same to ½ inch or ¼ inch. This makes an excellent feed for those plants which use roller mills as finishers in the raw end.

Vulcanite Specifications

Size Mill	Hopper Open-ing	Size Feed	Capacity Tons Per Hour			Speed	Horse Power	Extreme Dimensions			Size Pulley		W'ght
			½″	⅜″	¼″	R.P.M.		L'gth	Width	Height	Diam.	Face	P'nds
1	14″x 5″	1½″	4	3	2	1500	15– 18	4′8″	6′3″	3′3″	16″	10½″	4200
2	18″x 6″	2 ″	7	5	3	1500	20– 25	4′8″	6′6″	3′3″	16″	12½″	5000
2xx	24″x 6″	2 ″	10	8	6	1500	30– 35	4′8″	7′	3′3″	20″	15 ″	6000
3	18″x 8″	2½″	20	18	15	1000	40– 50	5′2″	7′	4′	20″	15 ″	10000
4	24″x 8″	3 ″	30	27	25	1000	70– 75	5′2″	7′4″	4′	20″	18 ″	12000
5	30″x 8″	3 ″	35	30	28	1000	90–100	5′2″	8′	4′	20″	20 ″	14000
6	36″x10″	3 ″	40	35	30	1000	110–125	5′2″	9′	4′	20″	22 ″	15500
7	40″x10″	3 ″	50	42	35	1000	125–150	5′2″	9′6″	4′	22″	24 ″	17500

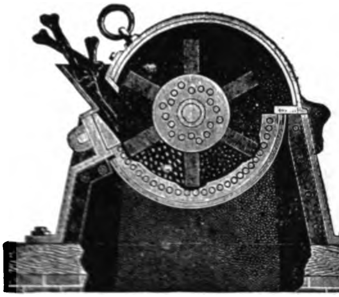
WRITE FOR CEMENT CATALOG No. 33.

(See also following pages)

(Continued from preceding pages)

WILLIAMS PATENT CRUSHER AND PULVERIZER CO.

BONE, TANKAGE, SHELL AND FERTILIZER GRINDERS



The Williams Grinders are so well known in the general Fertilizer field that we do not deem it advisable to go into any lengthy explanation as to just what they will do on Fertilizer material, for we have over 400 in operation; we will, however, give below a few uses for these machines on Bone and Tankage.

They successfully grind Steamed and Junk Bone, Packing House and Garbage Dry Tankage, Raw Bone, Clam and Oyster Shells, Beef Scraps and Cracklings, Corn, Cob and Cereal, etc.

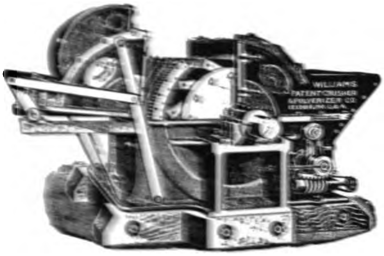
Specifications Regular Bone Mills

Number of Machine	Dimensions of Hopper Opening	Size of Feed	Capacities Approximate Per Hour			Pulley Dimensions		Speed	Horse Power Approx.	Dimensions Approximate Extreme			Approx. Weight Heaviest Piece	Weight Approx. Total Lbs. Net	Weight Approx. Total Lbs. Gross
			Mesh 10 Dry Tankage	Mesh 8–10 Steamed or Dry Bone	Mesh ⅛–5 Green or Raw Bone	Dia.	Face	Rev. Per M.		Length	Width	Height			
00	8x4	3"	300 lbs.	500 lbs.	250 lbs.	8	6½	2600	5–7	3'2"	4' 1"	2'6"	300	1400	1500
0	12x5	4"	1500 lbs.	1 ton	1000 lbs.	8	8½	1800	10–12	3'6"	5' 1"	2'6"	325	1900	2000
1	14x6	4"	1 ton	1½ tons	1500 lbs.	16	10½	1600	20–22	4'8"	5'10"	3'3"	575	3650	4000
2	18x6	4"	1-2 tons	2½ tons	2500 lbs.	16	12½	1600	25–30	4'8"	6' 3"	3'3"	575	4200	4500
2xx	24x6	4"	2-3 tons	4 tons	2 tons	20	15	1600	30–35	4'8"	7'	3'3"	575	5000	5600
3	18x8	5"	4-5 tons	6 tons	4 tons	20	15	1000	40–45	6'	6'10"	4'2"	1030	7500	8000

WRITE FOR COMPLETE FERTILIZER CATALOG No. 35

CHIP SHREDDERS

For Turpentine, Alcohol, Extract Plants and Pulp Mills



The ease with which this machine is *opened for repairs or inspection* is noticeable. The cover is *split vertically* in the center and held with "*hinged*" bolts, the back or movable half of cover is attached to an *elevating mechanism* which raises and moves this back half of cover. *One man* moves a lever and the cover slides *backwards with ease.*

When wishing to open machine *one man* loosens 4 nuts on hinged bolts, swings bolts clear of cover, takes hold of lever and slides *cover backwards* and has by this way, the work of five minutes.

The operator can then inspect or remove ***hammers, cages, discs,*** **or any other** *inside part.*

This is an *innovation* found on *no other* similar **machine and** is **another point** of "*accessibility*" so *prominent* in the *Williams shredders.*

The log wood, stumps or slab from Southern saw **mills** is **first put through a** Hog or Chipper, and reduced to about the size of an *ordinary* ***hand***, it is then passed to a Williams shredder where it is reduced to a *fine uniform.* ***product***, **easily** handled and in excellent shape for the extraction of **Turpentine, Rosin, Chips for** Pulp and Extract.

WILLIAMS PATENT CRUSHER AND PULVERIZER CO.

Specifications Chip Shredders

No. of Mill	Hopper Opening	Size of Feed	Capacity per Hour Tons			Pulley Inches		Speed	Horse Power	Extreme Dimensions			W'ght Gross	W'ght Net
			⅜"	¼"	⅛"	Dia.	Face	R.P.M.		L'gh	Width	H'ght	P'nds	P'nds
0	12"x 5"		¾	½	¼	8"	8½"	2000	10	3'6"	5' 1'	2' 6"	2000	1800
1	14"x 5"		2	1	½	16"	10½"	1200	18	4'8"	5'10"	3' 2"	4200	3800
2	18"x 6"		3	2	1	16"	12½"	1200	22	4'8"	6' 3"	3' 2"	4800	4200
2xx	24"x 6'		4	3	1½	20"	15 "	1200	30	4'8"	7'	3' 2"	5500	5000
3	18"x12"		5	4	2½	20"	15 "	1000	40	6'	6'10"	3'11"	8000	7500
4	24"x12"	Whole Chips	7	6	4	20"	20 "	1000	60	6'	8'	4' 2"	9500	9000
5	30"x12"		10	8	6	20"	22 "	1000	75	6'	8' 6"	4' 2"	10500	10000
6	36"x12"		12	10	8	20"	24 "	1000	85	6'	9'	4' 2"	11000	10500
7	40"x12"		16	15	10	20"	24 "	1000	100	6'	9' 6"	4' 2"	12000	11500
8	48"x12"		19	17	12	22"	24 "	1000	120	6'	10'	4' 2"	14000	13000
9	54"x12"		22	20	15	22"	26 "	1000	140	6'	11'	4' 2"	15000	14000
10	60"x12"		24	22	18	22"	30 "	1000	165	6'	12'	4' 2"	17000	16000

These Capacities vary with Condition of Chips, also Operating Conditions—Likewise Variation in Horse Power.

WRITE FOR SHREDDER CATALOG No. 38

CRUSHERS AND GRINDERS FOR GENERAL WORK

Limestone, Shale, Clay, Coal, Gypsum, Lime, Oil Cake, Bone, Tankage, Oyster and Clam Shells, Guano, Phosphate Rock, Fish Scrap, Marl, Natural Cement, Fire Clay, Calcined Clays, Tobacco Stems, Ochres, Kaolin, Corn Cobs, Peat, Barytes, Mica, Sugar, Salt, Stick-Lac, Stucco, Feed of all kinds Chemicals of all kinds, and many other materials.

Specifications Oil Cake Grinders

Size Mill	Hopp'r Ope'ng	Size Feed	Capacity Tons Per Hour				Size Pulley		Sp'd	Horse Power	Extreme Dimensions			W'ght
	Inches	Using Breaker	Nut	Pea	Fine Meal	Nut, Pea & Meal	Dia.	Face	R.P.M.		L'gth	W'th	H'ght	P'nds
00	8x4	Whole Cakes	1	¾	½	¾	8"	6½"	2000	4- 6	3'6"	4'1"	2'6"	1400
0	12x5		1½-2	1-1½	1	1	8"	8½"	1800	8-10	3'6"	5'1"	2'6"	2000
1	15x6		2½-3	1½-2	1½	1½-2	16	10½	1600	15- 18	4'8"	5'10"	3'2"	3650
2	18x6		3- 4	2½-3	2	2½-3	16	12½	1600	20- 25	4'8"	6'3"	3'2"	4500
2xx	24x6		5- 6	3- 5	3	3- 5	20"	15"	1600	30- 35	4'8"	7'	3'2"	5300
3	18x8		8-10	6- 8	5	6- 8	20"	15"	1000	40- 60	6'	6'10"	4'2"	8000
4	24x8		10-12	8-10	6	8-10	20"	18"	1000	70- 80	6'	8'	4'2"	9500
5	30x8		12-15	10-12	8	10-12	20"	20"	1000	80-100	6'	8'6"	4'2"	12000

Larger Sizes Built to Order.

WRITE FOR OIL CAKE CATALOG No. 39

Specifications Clay and Shale Grinders

Size Mill	Hopper Op'ning	Size Feed	Approx. Cap'city Brick per 10 Hrs.		Size Pulley Inches		Speed	Horse Power	Extreme Dimensions			Wgh't
	Inches		Medi'm Size Grind'g	Fine Grind'g	Dia.	Face	R.P.M.		Len'th	W'dth	Height	P'nds
1	10x14	6"	25000	20000	20	10½	1400	30-35	7' 3"	6'6"	4'11"	8500
2	20x12	7"	30000	25000	20	15	1400	40-45	7' 3"	7'0"	4'11"	9500
3	30x12	8"	40000	30000	20	15	1400	55-60	7' 3"	8'0"	4'11"	11500
4	40x12	8"	45000	40000	20	17	1400	70-75	7' 3"	9'0"	4'11"	15000
5	30x16	From Steam Shovel	55000	45000	20	18	1000	80-90	8'10"	9'6"	5'10"	18500
6	40x16		65000	60000	24	20	1000	100-110	8'10"	10'6"	5'10"	22000
7	50x16		80000	75000	24	22	1000	125	8'10"	11'7"	5'10"	25000
8	60x16	"	100000	85000	24	24	1000	150	8'10"	12'6"	5'10"	27000
9	70x18	"	120000	100000	24	26	1000	175	8'10"	13'6"	5'10"	28500
10	80x18	"	130000	120000	26	26	1000	200	8'10"	15'0"	5'10"	30000

WRITE FOR CLAY CATALOG No. 40

Mention material you wish to crush or grind and we shall see that you receive the proper catalog.

CHAMBERS BROTHERS COMPANY

Main Office and Works

FIFTY-SECOND AND MEDIA STS., PHILADELPHIA, PA.

MANUFACTURERS OF BRICK MAKING AND CLAY WORKING MACHINERY

BRICK MAKING MACHINERY

with capacities of from 10,000 to 100,000 daily

Briquetting Machines

Single and Double Shaft Mixers

The C. A. Wentworth Washing Machine

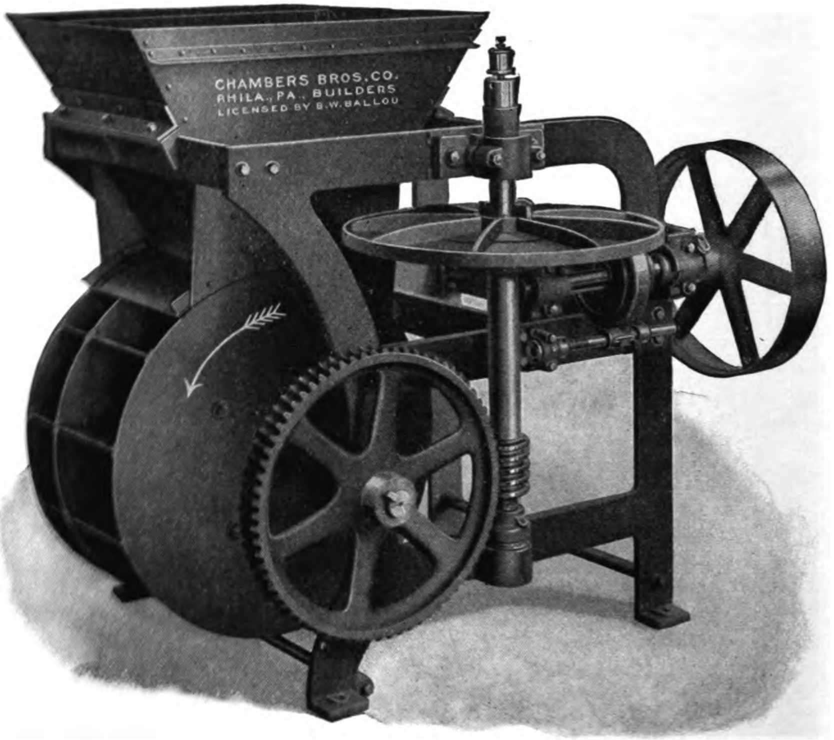
Roll Crushers

Disintegrators—Six Sizes

Pan Grinders for both Dry and Wet Grinding

7½	feet	diameter	Dry Pan,	weight	25,000	lbs.
9	"	"	" "	"	40,000	"
8½	"	"	Wet Pan,	"	46,000	"

Measuring and Feeding Machines, for feeding dry materials in fixed proportions.

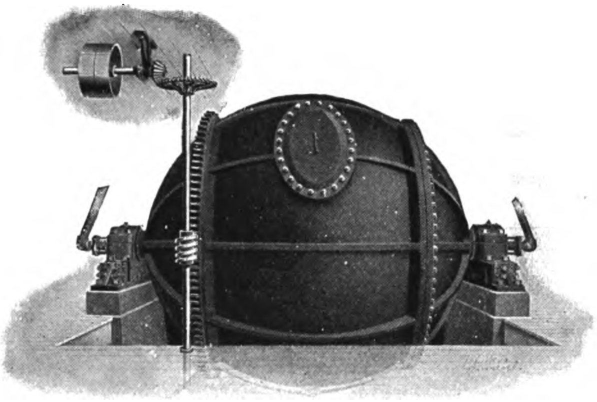


The Keystone Measuring and Feeding Machine

THE HOOVEN, OWENS, RENTSCHLER COMPANY

HAMILTON, OHIO

SUGAR MACHINERY, CAST IRON GLOBE DIGESTERS AND COOKERS FOR PAPER MILLS AND BLEACHERIES, PLATE GLASS FINISHING MACHINERY, SEMI-STEEL, STEEL RE-INFORCED ANVIL BLOCKS, FLEXIBLE COUPLINGS, AND SPECIAL HEAVY CAST IRON CASTINGS



Globe Digester and Cooker

The cast iron Globe Digester and Cooker is made in sizes up to and including 12 feet in diameter and is equipped with adjustable babbitted trunnion bearings. The drive may be from the ceiling hangers, as shown in illustration, or from beneath the floor—at the option of purchaser.

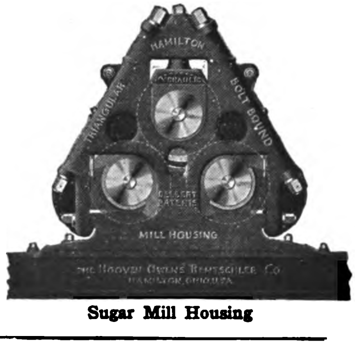
The Anvil Blocks are made in any size and arranged to accommodate any make of hammer. They are composed of a special mixture of semi-steel and thoroughly steel-re-inforced by the HAMILTON process.

The Sugar Mill Housing shown is thoroughly triangular bolt bound, and of such design that the completed housing is of maximum possible strength in every direction. This illustration shows more plainly than any description its excellent design for resisting the enormous pressures to which it is subject.

Re-Inforced Anvil Block

86" Semi-Steel Low Pressure Cylinder

The 86" Cylinder illustrated is a good example of our large semi-steel castings and proves that we have excellent facilities for making cast iron or semi-steel castings of any size and weight consistent with modern foundry practice.



Sugar Mill Housing

THE MARION STEAM SHOVEL CO.

STATION D. MARION, OHIO

New York
[illegible]

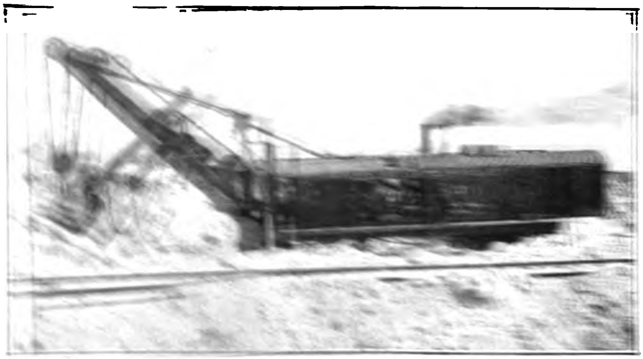
Atlanta
Candler Bldg.

Chicago
Monadnock Block

MAKERS OF EXCAVATING MACHINERY OF EVERY DESCRIPTION: RAILROAD STEAM SHOVELS, REVOLVING STEAM SHOVELS, TRACTION STEAM SHOVELS, ELECTRIC SHOVELS, DIPPER DREDGES, SUCTION DREDGES, ELEVATOR PLACER MINING DREDGES, SCRAPER BUCKET EXCAVATORS, RAILROAD DITCHERS, LOG LOADERS, BALLAST UNLOADERS

STEAM SHOVELS, DREDGES AND BALLAST UNLOADERS

We will welcome the chance to give you full detail.



M. D. KNOWLTON CO.

Main Office and Works

24 ELIZABETH ST., ROCHESTER, N. Y., U.S.A.

NEW YORK LONDON CHICAGO

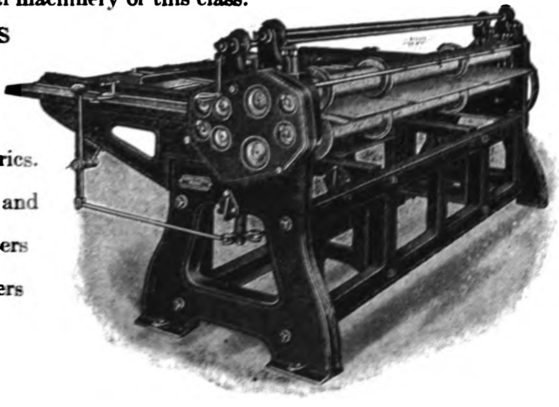
PAPER BOX AND SHIPPING CASE MACHINERY

MACHINES FOR CUTTING, TREATING AND FORMING, PAPER BOARD AND SHEET FABRICS.

Our experience in designing and making machines for this class of work extends over a period of thirty years. Our shop facilities are excellent. Many of the machines we manufacture are necessary to other industries as well as to that of the paper box. Below is only a partial list of the standard and automatic machines we manufacture and carry in stock. We solicit inquiries for standard and special machinery of this class.

CUTTING MACHINES

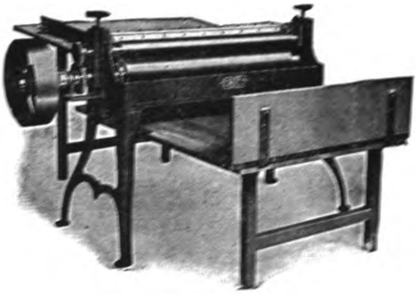
for Slitting, Sheeting or Shape Cutting, Paper, Pulp, Fibre or Corrugated Board and Sheet Fabrics.
Scorers
Rotary Paper Slitters and Rewinders
Rotary Cardboard Slitters
Corner Cutters
Slotters and Flap Cutters
Folding Box Slotters
Roll Sheet Cutters
Neck Choppers
Thumbhole Machines
Skiving Machines
Round and Oval Cutters
Rotary Cutting Knives



Heavy Rotary Slitter for Fibre and Corrugated Board

TREATING MACHINES

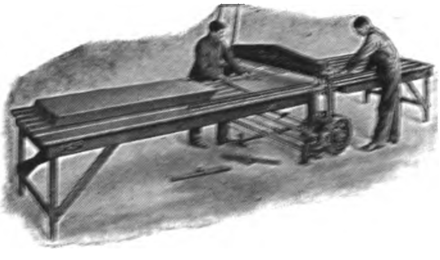
for Coating Paper and Cardboard with Glue, Silicate of Soda, Paste and other Liquid Solutions.
Automatic Gumming Machines
Plain Gumming Machines
Sheet Gluers
Sheet Pasters
Flange Gluers
Folding Box Gluers
Paraffine Coaters
Silicate of Soda Coaters
Glue Cookers and Mixers
Glue Pots



Paraffine Coating Machine

FORMING MACHINES

for Creasing, Bending and Shaping Paper and Cardboard.
Automatic Creasers and Slotters
Folding Box Creasers
Flange Benders
Plain Corner Stayers
Turn-in Corner Stayers
Ender and Corner Stayers
Tape Stayers
Covering Machines
Topping Machines
Trimming Machines



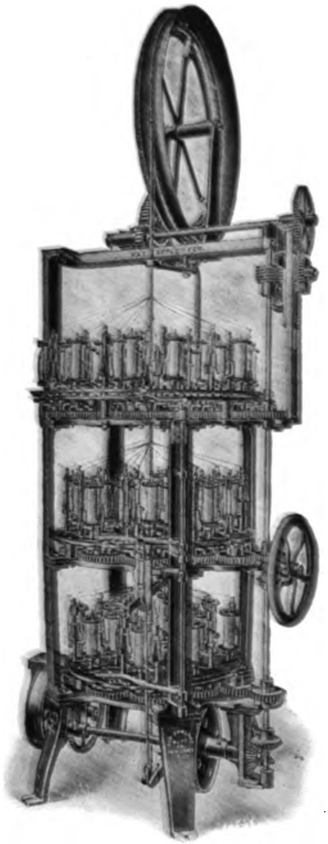
Straight Bar Creaser for Fibre and Corrugated Board

NEW ENGLAND BUTT COMPANY

PROVIDENCE, R. I.

European Agents: Selson Engineering Company, Ltd., London, England

MANUFACTURERS OF BRAIDING MACHINERY; MACHINERY FOR INSULATING WIRES AND CABLES.



Triple Deck 16x20x24.
No. 1 Cable Braider.

BRAIDING MACHINERY

American and German Type

Used for making plain and fancy braids for dress trimmings and millinery, round and flat shoe laces, soutache braids, candle wicking, tapes, cords, banding, clothes lines, fish lines, packing, gas tubing and rubber hose, round and flat elastic.

Sash Cord Braiders for making solid sash and curtain cord of various sizes.

Sash Cord Finishers for polishing solid sash cord.

Silk Covering Machines for covering cotton with silk.

Braid Spooling and Measuring Machines.

Rubber Spreading Machines, built of any desired width for applying a thin coating of rubber to cloth.

INSULATING MACHINERY.

Single, Double and Triple Deck Braiders.

These are made in all sizes and combinations for covering wires from small sizes up to large cables.

Magnet Wire Machinery for silk and cotton covering arranged to handle round and flat wires.

Annunciator Wire Winders, Single, Double or Triple Deck.

Taping Machinery for taping wires or cables with paper or other materials.

Polishing Machines, for insulated wires and cables from the small sizes up to 3″ cables.

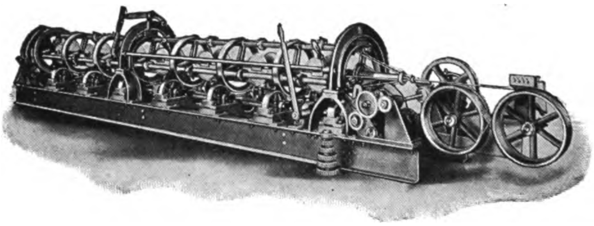
Wire Measuring Machines.

Twinning Machines.

Rubber Strip Covering Machines, for applying rubber insulation to wires and cables with either single or double seam. These machines are built in several sizes and handle from one up to twenty wires at a time.

NEW ENGLAND BUTT COMPANY

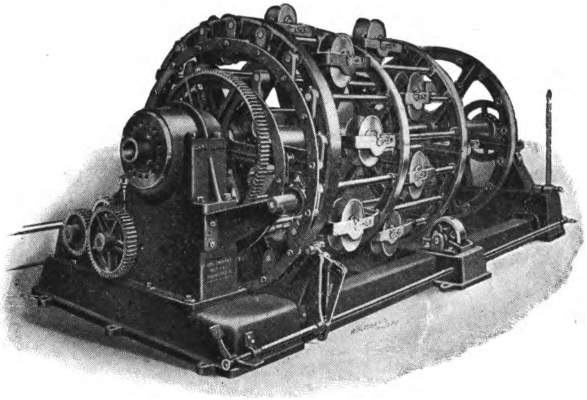
MACHINERY FOR THE MANUFACTURE OF WIRE ROPES AND CABLES



7 REEL HIGH SPEED STRANDING MACHINE.

In this type of machine the reels are carried in stationary cradles hanging at the center of the machine and the frame revolves about them.

By this construction, the machine being perfectly balanced, a very high speed is attainable. It is built in several sizes from small machines, for making the initial strands of small wire ropes, up to large laying machines holding 2000 lbs. to each reel. It is also built for making 19 wire strand.



24 REEL HORIZONTAL CABLING MACHINE.

This machine is of the planetary type in which the reels are kept in a vertical position by means of cranks and an eccentric ring at the rear of the machine.

It is built in single heads or in tandem form with any combination of heads and is used for making cables of concentric strand and also for armoring cables.

We are prepared to furnish this type of machine in a large variety of sizes.

Take up Fixtures for the above machines are built in either the single drum or the double grooved drum types.

Wind up Reel Fixtures with automatic and adjustable traverse motions can be furnished suitable to handle any size of reels.

AUTOMATIC WEIGHING MACHINE COMPANY

[illegible]

AUTOMATIC WEIGHING, PACKING AND SEALING MACHINERY

[illegible]

TO ENGINEERS

[illegible] efficient, economical [illegible]

[illegible] constructed with the [illegible] efficiency [illegible]

[illegible] weighing machine is now a recognized necessity in manufacturing, [illegible] packing goods into packages [illegible] checking [illegible] we will [illegible] communication.

TO MANUFACTURERS

[illegible] expectations of the [illegible] machinery [illegible] finding such a [illegible] between [illegible]

[illegible] bearing in [illegible] will [illegible] propositions [illegible] give our proposals careful and intelligent consideration, [illegible] view of what we will undertake to do.

[illegible] where we have found that for some reason, clearly in[illegible], we were persuaded the conditions would not make the [illegible] machinery truly profitable to the manufacturers and therefore [illegible], rather than merit the displeasure of our customers by putting them to needless trouble and probable expense.

We, of course, put before anything else the fulfilling of all guarantees which are clearly stated in our proposals, and strive to do even a little better, so that when a balance is struck between us there remains something to our credit in the good opinion of our customers.

TINIUS OLSEN TESTING MACHINE CO.

500 North 12th Street, PHILADELPHIA, PA.

TESTING MACHINERY AND INSTRUMENTS

We manufacture a complete line of Olsen testing machines for the Physical testing of any material under any condition. These machines are designed for accuracy, sensitiveness, rigidity, strength and endurance, and they are today the recognized Standard of high grade testing the world over.

We are also the exclusive manufacturers for the "Turner" Impact Testing Machine, "Fremont" Impact Testing Machine, "White-Souther" Endurance Testing Machine, "Upton-Lewis" Fatigue and Toughness Testing Machine, "Norris" Slip Abrasion Testing Machine, and exclusive American Agents for the "Herbert & Fletcher" file tester and tool steel testing machine.

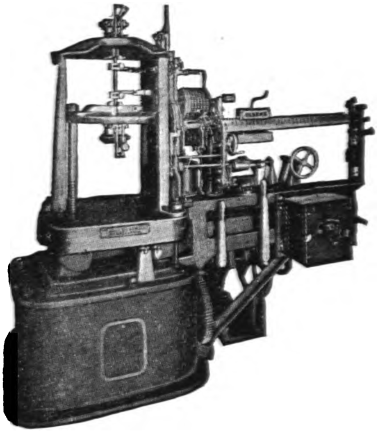
We build machines for applying all tests as enumerated below and are prepared to design and build special machines for determining any physical property.

Our Catalogue is divided into eight parts as follows:

Part A	Universal Testing Machines and Instruments.
Part B	Spring Testing Apparatus and Spring Machinery.
Part C	Cement and Concrete Testing Machinery.
Part D	Cloth, Yarn, Paper, Rubber and Leather Testing Machinery.
Part E	Wire, Chain and Anchor Testing Machinery.
Part F	Oil, Grease, Bearing Metal Testing Machines, Viscosimeters, Dynamometers, etc.
Part G	Transverse Testing Machinery.
Part H	Special Testing Machinery. (Impact, Indentation, Vibratory, Hardness, Endurance, Bending and Torsion Testing Machinery.)

Any of the above parts mailed upon request.

10,000 lbs. to 1,000,000 lbs. in capacity.



Olsen's Universal Autographic Testing Machine. Three Screw Type with Direct Motor Drive. Patented January 7, 1908.

Upton-Lewis Toughness Testing Machine. Patent Applied For.

Our Olsen Testing Machines have received the highest Awards at all Expositions, and the Elliot-Cresson Gold Medal from the Franklin Institute.

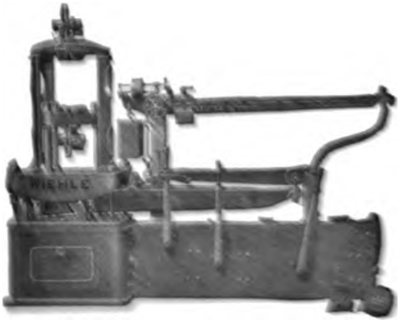
The Upton-Lewis machine is the very latest type of Testing Machine designed for making alternate stress or fatigue tests. The machine is unique and wonderful results are obtained by its use. Full description and particulars upon application.

RIEHLÉ BROS. TESTING MACHINE CO.

1424 N. NINTH STREET, PHILADELPHIA, PA.

TESTING MACHINES AND TESTING APPLIANCES.

We are the Oldest and Largest Testing Machine Manufacturers in the United States. Established nearly 50 years ago. The Riehlé Testing Machines are used by the leading Colleges, Steel and Iron Works, United States Government, many foreign Governments, and are recommended by many of the most prominent and successful Engineers throughout the world. We design and build these machines from **5000 lbs. to 1,000,000 lbs. and over in capacity** for the determination of any physical property.



Riehlé U. S. Standard Vertical Screw-Power Testing Machine. Three Screw Type. 100,000 Lbs. Capacity

Features of Riehlé Testing Machines

- Designed Right.
- Plenty Strong Enough.
- No Sparing of Material.
- Long Base Lines.
- Simple in Construction.
- All Parts Accessible, without taking whole machine apart.
- Fine Finish. Attractive in Appearance.

NOTE

We are now building all the Riehlé Vertical Screw Power-Testing Machines with two (2), three (3), or four (4) Main Pulling Screws as may be desired.

For quick and convenient reference our complete line of Testing Machines is catalogued as enumerated below

RIEHLÉ TESTING MACHINE CATALOGUE "A"

Illustrating and describing all the larger Riehlé U. S. Standard Testing Machines, Screw and Hydraulic Power, also new and ingenious tools for same; Machines for Long Transverse Members, Torsional and Impact Testing, also Calibrating Levers.

RIEHLÉ CATALOGUE "AA" OF EXTENSOMETERS, COMPRESSOMETERS, AND TORSION METERS.

Containing illustrations and descriptions of the very latest and best Riehlé Extensometers, etc.

RIEHLÉ TESTING MACHINE CATALOGUE "B"

Embracing all the various styles of Riehlé U. S. Standard Testers for Wire, Cloth, Canvas, Cord, Twine and Textile Fabrics of all kinds, also for every variety of test.

This Catalogue is well worth your careful perusal.

RIEHLÉ CHAIN TESTING MACHINE CATALOGUE "C"

In this Catalogue is found all that is *newest and best* in Testing Machinery for Chain, Wire, Hemp, Rope, Eye-Bars, Bridge Irons, etc. Special Machines for different forms of materials can be designed along these lines. We also furnish Hydraulic Pumps separately if desired. We claim these Machines are the Strongest and Best in the World.

RIEHLÉ TESTING MACHINE CATALOGUE "D"

Containing illustrations of Transverse, Bending, and Special Testing Machines, Rope Twisters, Loam Mills, Pipe Provers, etc.

Every Foundry and Machine Shop should install some of the articles shown in this Catalogue.

RIEHLÉ TESTING MACHINE CATALOGUE "E"

Those interested in Machines for testing Springs of all kinds, also Oils and Bearing Metals, are specially referred to this Catalogue as containing all the newest and best Machines for this purpose.

RIEHLÉ CATALOGUE "F"

In this Catalogue are presented illustrations and descriptions of superior designs and patterns of Hand and Power Hydraulic Pumps and Presses, also Riehlé-Robie Patented Screw Jacks, etc.

RIEHLÉ CEMENT-TESTING MACHINE CATALOGUE "G"

In this Catalogue one will find "everything that is good" in the way of testing Cements, Asphalts, Building Material, and also every *conceivable article* for thoroughly equipping a Physical Testing Laboratory for that kind of work. Be sure and send for this Catalogue if you are interested.

RIEHLÉ ROAD MATERIALS TESTING MACHINE CATALOGUE "K"

In this Catalogue you will find illustrations of everything to make tests of Road Materials, as used by the United States Government, Department of Public Roads, Washington, D. C.

Select the CATALOGUES you want when ready to order.

CYRUS CURRIER & SONS

ESTABLISHED 1842. INCORPORATED 1909

NEWARK, N. J.

ENGINEERS, MACHINISTS, IRON FOUNDERS. PATTERN MAKERS AND MACHINE BLACKSMITHS.

Our principal business is contract manufacturing and jobbing in all of the above lines. In contracts requiring patterns, iron castings, forgings and machine work, we are particularly well equipped, as we do not require the services of outsiders, consequently being able at all times to give the work personal supervision which assures the customer prompt and careful attention.

Partial list of what we manufacture:

Complete equipments for the manufacture of coated cloths, consisting of four styles of coating or spreading machines.

Hot room, drying and festooning equipments.

Two roll calenders, light and heavy styles.

Two roll embossers, light and heavy styles.

Embossing presses of steel, platens 24″ x 48″, 24″ x 54″, 24″ x 58″. Other sizes to order.

The most improved machinery for operating drawbridges by steam, gasoline, or hand power, also sole manufacturers of Mershon's patented device for locking rails on drawbridges (to prevent derailment of trains), pronounced by engineers the only positive safeguard. We have many of both the above equipments installed, several in the immediate vicinity.

Hand power pillar cranes for freight stations and piers.

Engravers' transfer presses.

Hydraulic presses and accumulators.

Forged steel rolls all sizes.

Pressed paper rolls from special stock paper.

A specialty of furnace castings, slag, metal pots and mould castings of our special iron.

Machinery for corrugating and lining straw board.

L. O. KOVEN & BROTHER

OFFICE—50 Cliff Street, New York City
Factory—JERSEY CITY, N. J.

ENGINEERS, MANUFACTURERS AND DESIGNERS. FABRICATED PLATE STEEL, COPPER, BRASS, TIN, ALUMINUM, ETC., OF ANY SHAPE. DESIGNERS OF SPECIAL APPARATUS FOR MANUFACTURING INDUSTRIES.

We are prepared to do plate work of every description for Ships, Mills, Mines, Factories, Plantations, Chemical Works, Paint Works, Paper Mills, Abattoirs, Fertilizer Plants, Water Works, Government Work, Sewage Systems, etc. We also make and design Special Apparatus and Machinery to meet the progress in all lines of business. WE HAVE THE FACILITIES FOR IMPROVING YOURS.

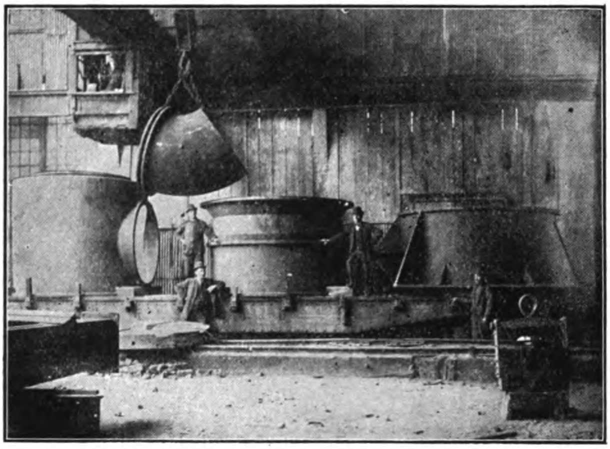
A Partial List of What We Make

- Autoclaves
- Bottle Sterilizers
- Bread Racks
- Can Washers
- Canned Goods Sterilizers
- Cheese Vats
- China Kilns
- Coil Boilers
- Condensed Milk Coolers
- Copper Tanks
- Copper Lined Steel Tanks
- Creosoting Tanks
- Drying Apparatus
- Exhaust Manifolds
- Extractors
- Galvanized Tanks
- Gasoline Tanks
- Gasometers
- Glass Kilns
- Glue Dissolvers
- Gum Washers
- Ham Boilers
- Hot Water Tanks
- Humidifiers
- Jacketed Tanks
- Kilns
- Lead Lined Tanks
- Malt Tanks
- Metal Melting Furnaces
- Mixers
- Mufflers
- Oil Filters
- Oyster Washers
- Percolators
- Pie Racks
- Pipe (Riveted)
- Plating Tanks
- Sand Blast Tanks
- Steam Kettles
- Sterilizers
- Stills
- Smoke Stacks
- Tanks (Air, Gas, Oil and Water)
- Tumblers
- Vacuum Pans
- Varnish Tanks
- Vulcanizers
- Water Stills

THE MARSHALL FOUNDRY COMPANY

PITTSBURG, PA.

INGOT MOLDS AND GREY IRON CASTINGS FOR ALL PURPOSES



Capacity 250 Tons per day

We make a specialty of large castings, such as: BLAST FURNACE CASTINGS, EVAPORATORS, CONDENSERS, SPECIAL EXHAUST OUTLETS, ETC.

CAST IRON

Ladle Linings, Cinder Pots, Kettles for Chemicals, Etc.

Our success in this line is the result of years of experience and the use of iron especially adapted for this class of work.

STRUCTURAL CAST IRON

Columns and Bases

Our facilities for production are unsurpassed, having a plant capacity of 250 tons per day.

INGOT MOLDS

Solid or Split

All kinds and sizes for Bessemer, Open Hearth or Crucible Steel.

We have on hand PATTERNS and EQUIPMENT for all sizes used in general mill work. We solicit your correspondence before placing your order.

THE PETROLEUM IRON WORKS CO.

SHARON, PA.

NEW YORK — ST. LOUIS — HOUSTON, TEXAS

FABRICATORS AND ERECTORS OF EVERY VARIETY OF LIGHT AND HEAVY STEEL PLATE CONSTRUCTION. TANKAGE FOR ALL PURPOSES, LARGE OR SMALL. OIL REFINERY EQUIPMENT, STAND PIPES, WATER TOWERS, SMOKE STACKS, PEN STOCKS, RIVETED STEEL PIPE, BLAST FURNACES, HOT METAL LADLES, BOILERS, ANNEALING BOXES, "LEMAN" COUNTER CURRENT CONDENSERS, "GEM" FUEL OIL BURNERS, "WASHINGTON" AUTOMATIC OIL AND GAS SEPARATORS, PORTABLE RECEIVING TANKS, CAR TANKS, ETC.

The Petroleum Iron Works Company is located on a property of forty acres, situated about three miles south of Sharon, Pa.

Our railroad facilities here are excellent, as the works have direct connections with the New York Central, the Erie and the Pennsylvania Railway Systems. Our trackage for receiving and shipping inbound and outbound freight is more than a mile in length, thus affording ample space for car storage and ideal facilities for making shipments. Car shortages and delays occurring where there is but one railroad connection are practically unknown in this district. We, therefore, feel sure the trade will fully appreciate this condition, as it enables us to guarantee our promises of delivery to points in every direction.

Our present plant consists of a substantial steel structure, fully equipped with modern machinery, tools and appliances, which insure accurate and rapid production. We are now in position to give our customers better satisfaction and more prompt service than ever before. Superior manufacturing facilities and careful shop inspection will continue to maintain our long established reputation for high class work.

It is difficult to prepare a catalogue that will adequately describe and illustrate all the classes of sheet metal structures and apparatus that we are in position to furnish and erect. The illustrations presented are shown merely as types of our various lines of work, among which we might enumerate the following:

Oil Storage Tanks (large and small)
Acid Storage Tanks
Water Tanks
Water Softener Tanks
Molasses Tanks
Turpentine Storage Tanks
Grain Tanks
Tar Tanks
Hydro-Pneumatic Tanks
Pressure Tanks
Filter Tanks
Car Tanks
Portable Receiving Tanks

Railroad Water Service Tanks
Oil Refineries (complete)
"Leman" Counter Current Condensers
"Washington" Automatic Oil and Gas Separators
"Gem" Fuel Oil Burners
Riveted Steel Pipe
Flumes
Penstocks
Blast Furnaces (complete)

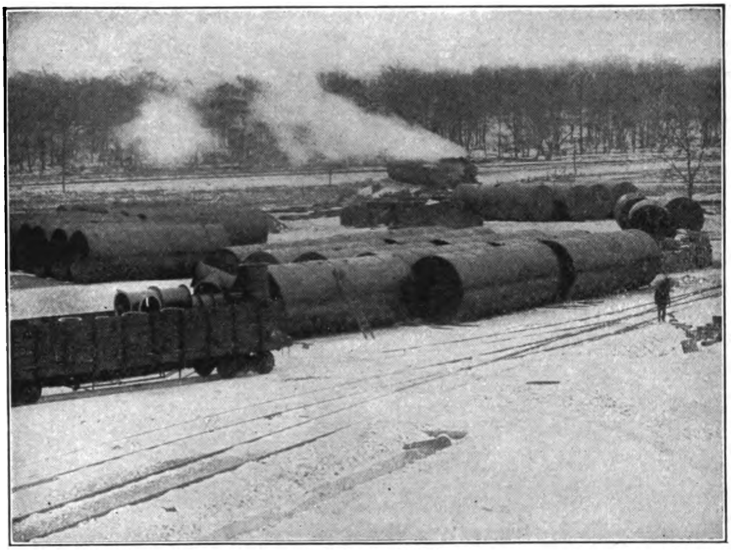
Converters
Hot Metal Ladles
O. H. Furnaces
Pulp Digesters
Galvanizing Kettles
Creosoting Cylinders
Condenser Boxes
Coal Bins
Steam Separators
Air Receivers
Water Towers
Stand Pipes
Smoke Stacks (Self-Supporting and Guyed)
Breechings, etc., etc:

Frequently special problems arise, and in such cases we are glad to offer the services of our Engineering Department. In order to assure prompt replies to inquiries we especially request complete detail information, including specifications and blue prints when possible. We hope by prompt and careful attention to our customers' inquiries to be favored with at least a portion of your valued orders.

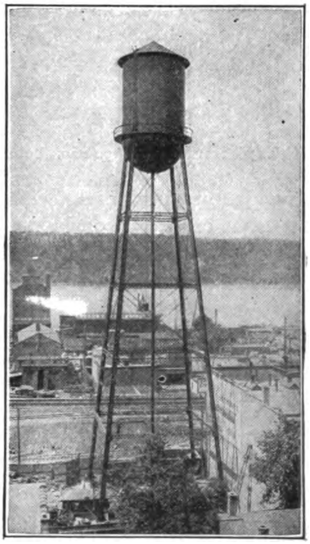
We issue no discount sheet owing to the constant fluctuations in prices, and to the fact that practically all of our products are built to order.

THE PETROLEUM IRON WORKS CO.

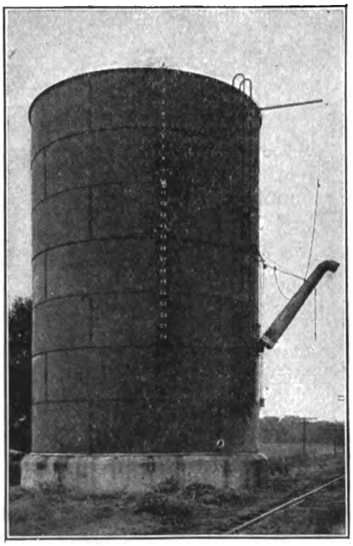
OIL REFINERIES—COMPLETE



10′ x 30′ Single, Double, and Triple Compartment Cylindrical Horizontal Oil Storage Tanks ready for shipment.



150 000 Gallon Water Tower,
Yonkers, N. Y
(Height over all 184′)

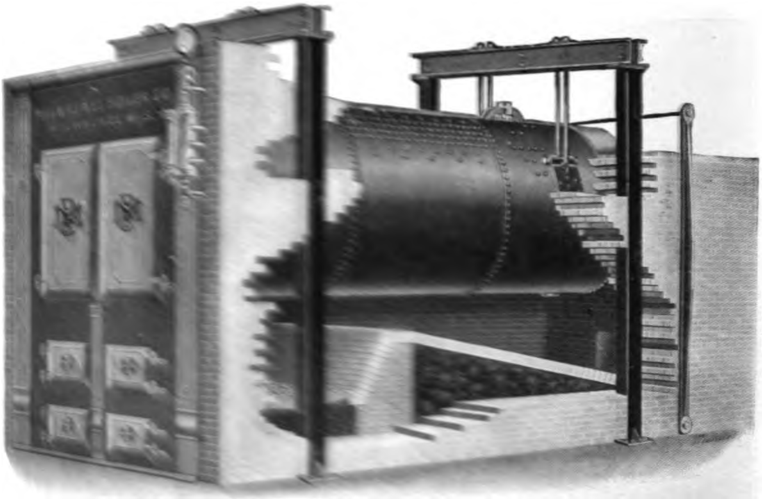


R. R. Water Service Tank.
Erected East Waco, Texas, for the
"Cotton Belt."

MILWAUKEE BOILER COMPANY

220 Oregon St., MILWAUKEE, WIS.

WE ARE PREPARED TO FURNISH ANYTHING IN STEEL PLATE CONSTRUCTION FOR BEET SUGAR REFINERIES, PAPER MILLS, OIL REFINERIES, SOAP FACTORIES, WOOD ALCOHOL AND TURPENTINE PLANTS, TANKS (FOR STORAGE OR PRESSURE) WITH RIVETED SEAMS, PENSTOCKS, RIVETED PIPE FOR HYDRAULIC AND STEAM PRESSURE, EXHAUST PIPES, STEAM HEADERS, EXHAUST HEATERS, BRICK HARDENING CYLINDERS, GALVANIZING POTS, RETORTS, STILLS, AGITATORS, STEAM PANS AND JACKET KETTLES.



Milwaukee high pressure [illegible] boiler with full front and suspension setting

We manufacture [illegible] pressures of 100, 125 and 150 pounds. [illegible] has been carefully considered and every precaution [illegible] safety and durability.

Both [illegible] rigid inspection and test assure that the highest [illegible]

Our engineering [illegible] at your disposal to assist you in designing [illegible]

We are prepared to [illegible] on Rendering Tanks, Self Supporting Stacks, [illegible] Water Jackets, Coal Hoppers, and other articles [illegible]

We carry a large stock [illegible] tubes, rivets, bars and flanges. This [illegible] shipment of all orders.

This [illegible] for boiler setting, also a full supply of valves and gauges.

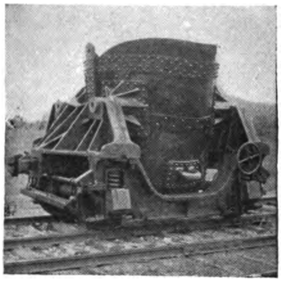
RITER-CONLEY MANUFACTURING CO.

PITTSBURGH, PA.

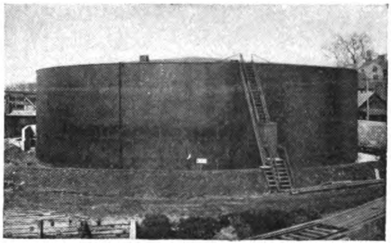
STEEL CONSTRUCTION

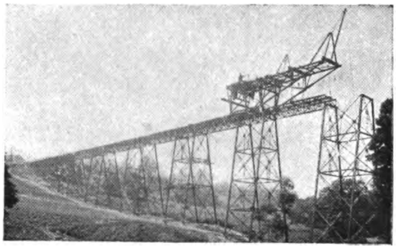
This company has splendid facilities for designing, fabricating and erecting such structures, etc., as are listed and illustrated below.

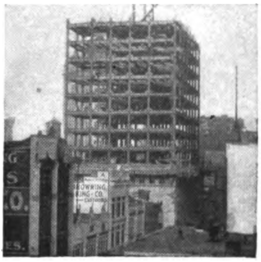
Barges
Blast Furnaces
Bridges
Buoys
Caissons
Converters
Car Tanks
Gas Holders
Gas Plants
Galvanizing Pots
Ladles
Mixers

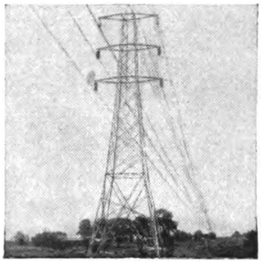


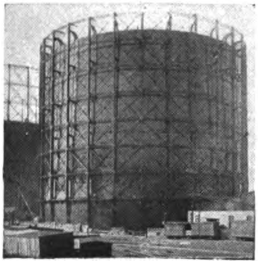
Penstocks
Pipe Lines
Pressed Steel of every Description
Stacks
Stand Pipes
Steel Ships
Steel Plants
Structural Steel Work
Sugar Crystallizers
Tanks
Towers for Transmission Lines

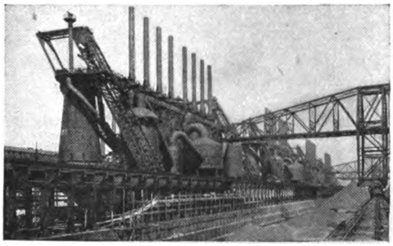












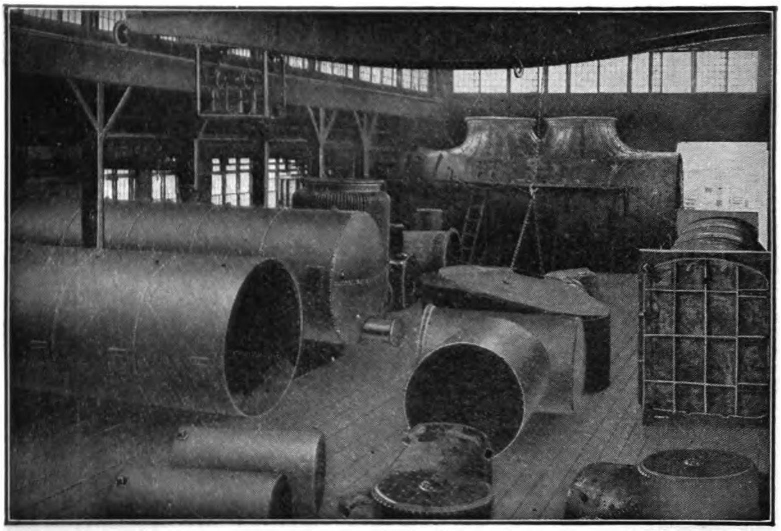
STRUTHERS-WELLS COMPANY

Established 1851

WARREN, PENNSYLVANIA

N. Y. Office, 50 Church St.

ANYTHING IN STEEL PLATE CONSTRUCTION FOR BEET SUGAR REFINERIES, PAPER MILLS, OIL REFINERIES, SOAP FACTORIES, WOOD ALCOHOL AND TURPENTINE PLANTS, TANKS (FOR STORAGE OR PRESSURE) WITH EITHER WELDED OR RIVETED SEAMS. PENSTOCKS, RIVETED PIPE FOR HYDRAULIC AND STEAM PRESSURE, EXHAUST PIPES, STEAM HEADERS, EXHAUST HEATERS, BRICK HARDENING CYLINDERS, GALVANIZING POTS, RETORTS, STILLS, AGITATORS, STEAM PANS, AND JACKETED KETTLES.



View of one corner of Erecting Floor

We will contract to furnish specially designed work in steel plate from customers' plans and specifications, either completely built up in the shop or assembled, knocked down and shipped in sections as may be called for.

Our equipment and experience enable us to handle both intricate and simple work with equal ease and dispatch. Our workmanship will pass the most rigid inspection.

We maintain a fully equipped estimating department at our shops and also at our New York Office. This enables us to furnish prices promptly.

If you want a specially designed piece of work, send us your drawings and specifications,—we have probably built it before, or at least something very similar to it.

Smoke breechings, stacks and air flues for modern buildings are right in our line.

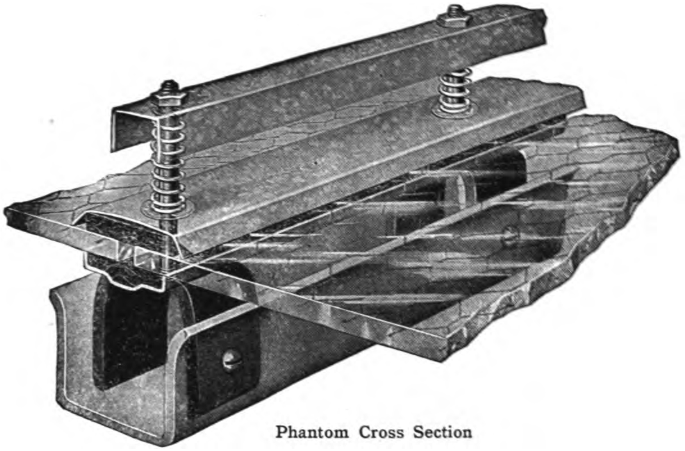
THE G. DROUVÉ COMPANY

BRIDGEPORT, CONN.

Telephone Connections
Western Union Code

BRANCH OFFICE
180 N. Dearborn St., Chicago, Ill.

"ANTI-PLUVIUS" PUTTYLESS SKYLIGHT & SASH OPERATING DEVICES



Phantom Cross Section

"ANTI-PLUVIUS" PUTTYLESS SKYLIGHT

The "Anti-Pluvius" Skylight is weather-proof. It can be furnished in any type and will be found to be a permanent construction. The glass is bedded on cow-hair felt which provides a cushion resting surface to take up shock, vibration or expansion and contraction. The weight of a man on the bridge is carried through to the supporting channels below without contact with or pressure on the glass. Each light is independent of every other and does not come in contact with metal, thus doing away with condensation from sweating. Manufacturers in general are gradually replacing old and worn out skylights with the "Anti-Pluvius," thereby establishing a standard and doing away with much crackage and breakage of glass. Other information furnished on request, together with estimates.

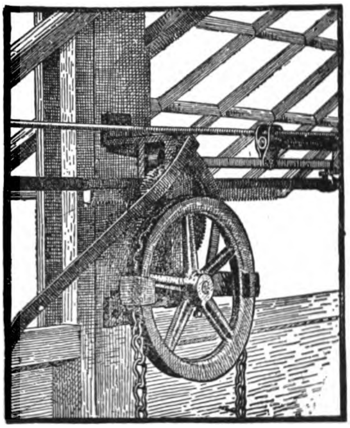
"STRAIGHT-PUSH" SASH OPERATOR

The "Straight-Push" Sash Operator operates any number of sash positively, quickly, and with individual power applied to each sash. A rack and pinion moving a line of ¾″ pipe, supported by brackets, backwards and forwards, is the guiding principle, and a push or pull is secured instead of torsion.

The main guide lever-arms are of ¼″ steel. The supporting brackets are formed of ¼″ steel with cast-iron spools on bearing shafts of phosphor bronze. The operating wheel has cut-steel gears with steel shaft controlling a cut-steel rack and pinion. The few connections are made with phosphor bronze washers between to prevent these parts rusting together.

A one-man control gives sufficient power to operate lines of sash 100, 200 or more lineal feet.

Full information on request.



Straight-Push Sash Operator

THE H. B. SMITH CO.

WESTFIELD, MASS.

NEW YORK

BOSTON

PHILADELPHIA

BOILERS AND RADIATORS FOR STEAM AND WATER WARMING

MILLS WATER TUBE BOILERS

No. [illegible] Steam Boiler

No. 24 Boiler
Width of Fire Pot 24 inches.
Rated capacity — Steam 900 ft. to 2025 ft.
Water 1500 to 3350 ft.

No. 34 Boiler
Width of Fire Pot 34 inches.
Rated capacity — Steam 2000 ft. to 5200 ft.
Water 3300 ft. to 8575 ft.

No. 44 Boiler
Width of Fire Pot 44 inches.
Rated capacity — Steam 3600 ft. to 9000 ft.
Water 5950 ft. to 14,850 ft.

No. 48 Boiler
Width of Fire Pot 48 inches.
Rated capacity — Steam 4800 ft. to 12,000 ft.
Water 7925 ft. to 19,800 ft.

[illegible]

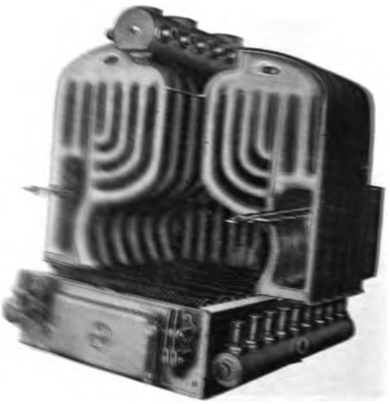
[illegible]

[illegible]

[illegible]

[illegible]

[illegible]



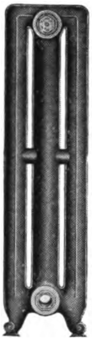
No. 44 Boiler—Interior

THE H. B. SMITH CO.

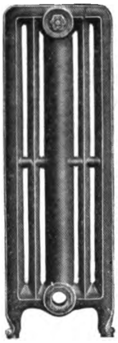
PRINCESS DIRECT RADIATORS

Single Column

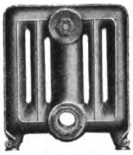
Two Column



Three Column



Five Column



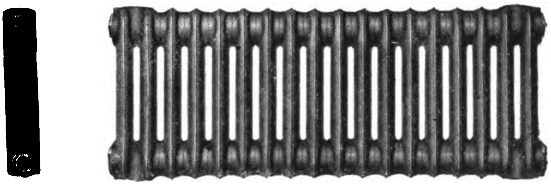
Five Column Window Height

Malleable Iron Push Nipple connection between Sections.

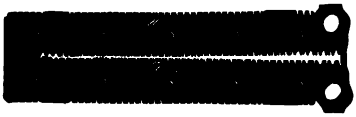
Test at Factory { Two tests 100 lbs. water.
One test 80 lbs. steam.

One and two column Radiators, Sections 3″ on centers.

Three and five column Radiators, Sections 3¼″ on centers.



PRINCESS WALL RADIATORS



Flange Surface

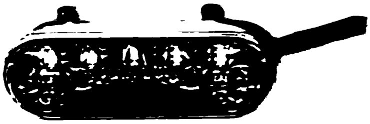
Indirect Radiators

FLANGE AND PIN EXTENDED SURFACE
for
STEAM AND WATER WARMING.

THE C. J. ROOT COMPANY

BRISTOL, CONN.

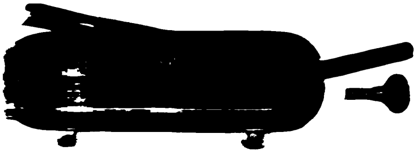
AUTOMATIC COUNTERS; WROUGHT BRASS HINGES, METAL STAMPINGS, ETC.



Bristol Counter

[illegible]

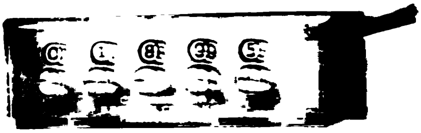
Finish: [illegible] or Oxidized Copper Finish.



Bristol Counter with Bar Lock

Specifications for this style are the same as for the regular pattern.

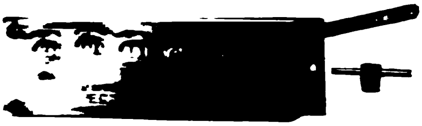
Number of Counter corresponds with number of figures.



"Elm City" Counter

No.	Size Ins.	Ship. Wt. Oz.	List Price
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

Finish: Polished Brass, Nickel Plated or Oxidized Copper.

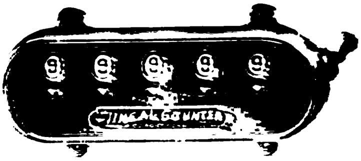


"Elm City" Set-Back Counter

No.	Size Ins.	Ship. Wt. Oz.	List Price
[illegible]	[illegible]	8	$8.00
[illegible]	[illegible]	21	10.00
[illegible]	[illegible]	24	12.00

We also make the "ELM CITY" WITH [illegible] the specifications of which are the same as [illegible].

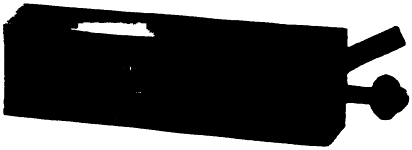
Number of Counter corresponds with number of figures.



No. 50 "Ro-Co" Counter
Operated by Rotating Shaft, No Springs

	Size Ins.	Ship. Wt. Lbs.	List Price
5 Fig. No. 65	[illegible]	[illegible]	$10.00
6 Fig. No. 66	[illegible]	[illegible]	12.00

Black Enamel Finish.



No. 25 "Ro-Co" Counter
Reciprocating Type

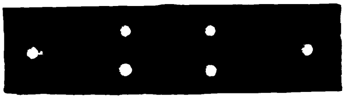
[illegible] Size [illegible] ins. Ship. Wt. 30 oz.
List Price, $12.00.
In Nickel Plated or Copper Oxidized Finish.

No. 55 "Ro-Co" Counter

4 Fig. No. 54. Size [illegible] ins. List Price $8.00
5 " " 55. [illegible] 10.00
6 " " 56. [illegible] 12.00

Made entirely without springs and has a nickel plated brass case.

WE ALSO MAKE A LINEAL COUNTER AND MEASURING MACHINE.
PLEASE WRITE FOR CATALOGUE AND DISCOUNT SHEET.

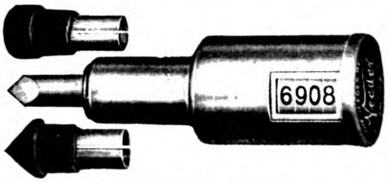


THE VEEDER MANUFACTURING CO.

HARTFORD, CONN.

MAKERS OF CYCLOMETERS, ODOMETERS, TACHOMETERS, TACHODOMETERS, COUNTERS AND FINE DIE CASTINGS.

COUNTERS AND TACHOMETERS



Veeder Clutch Speed Counter

Absolutely reliable instruments for the indication of speed or the recording of output from machines.

Essential in Scientific Management for Piece Work Records.

Elevator Mileage—Recorders which we furnish make it possible to keep satisfactory records of service and upkeep.

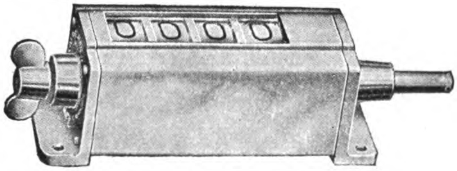
VEEDER FORM C TACHOMETERS

The Form C Tachometer is a portable instrument for indicating revolutions per minute of dynamos, motors, shafting, etc. The only moving part is the paddle wheel in the centrifugal pump. This has radial blades and hence indicates when run in either direction. When paddle is revolved, the liquid is forced out of pump and up the indicating tube by centrifugal force.

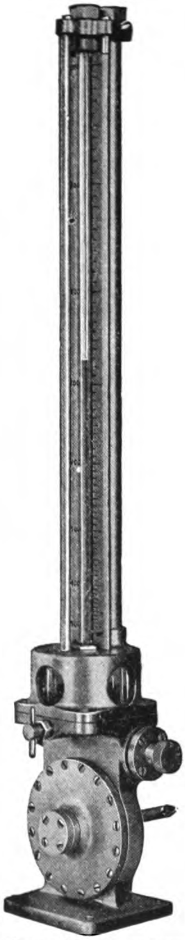
SETBACK COUNTERS

Revolution, Direct Drive and Rotary Ratchet

Especially suitable for punch presses, looms, stamping machines, duplicators, addressographs, mimeographs, coil winders, pumps, engines, screw machines, typesetting machines, or on any machines on which an accurate record of parts made is desired.



Rotary Ratchet Counter



Form C Tachometer

FINE DIE CASTINGS

When accurately made parts are wanted in large quantities, they may be manufactured most economically by casting to their finished size and shape. Our alloy has a tensile strength of about 15,000 lbs. and compressive strength of 20,000 lbs. It is about equal in strength to aluminum or cast iron.

Complete Catalogue on request.

CO.

IG MACHINERY,
MONIA VALVES AND

WON

Unit

ano, Canada

rigerating Machines for
on all over

antages. *Simplicity*—no
Efficiency,
our
every part of it ourselves,

BOILER

r a strictly **safe, durable**
are:

ete combustion.
Steam.
adiness of Water Level.
bility of construction.
Wrought steel construction throughout.
Safety, Efficiency, Durability.